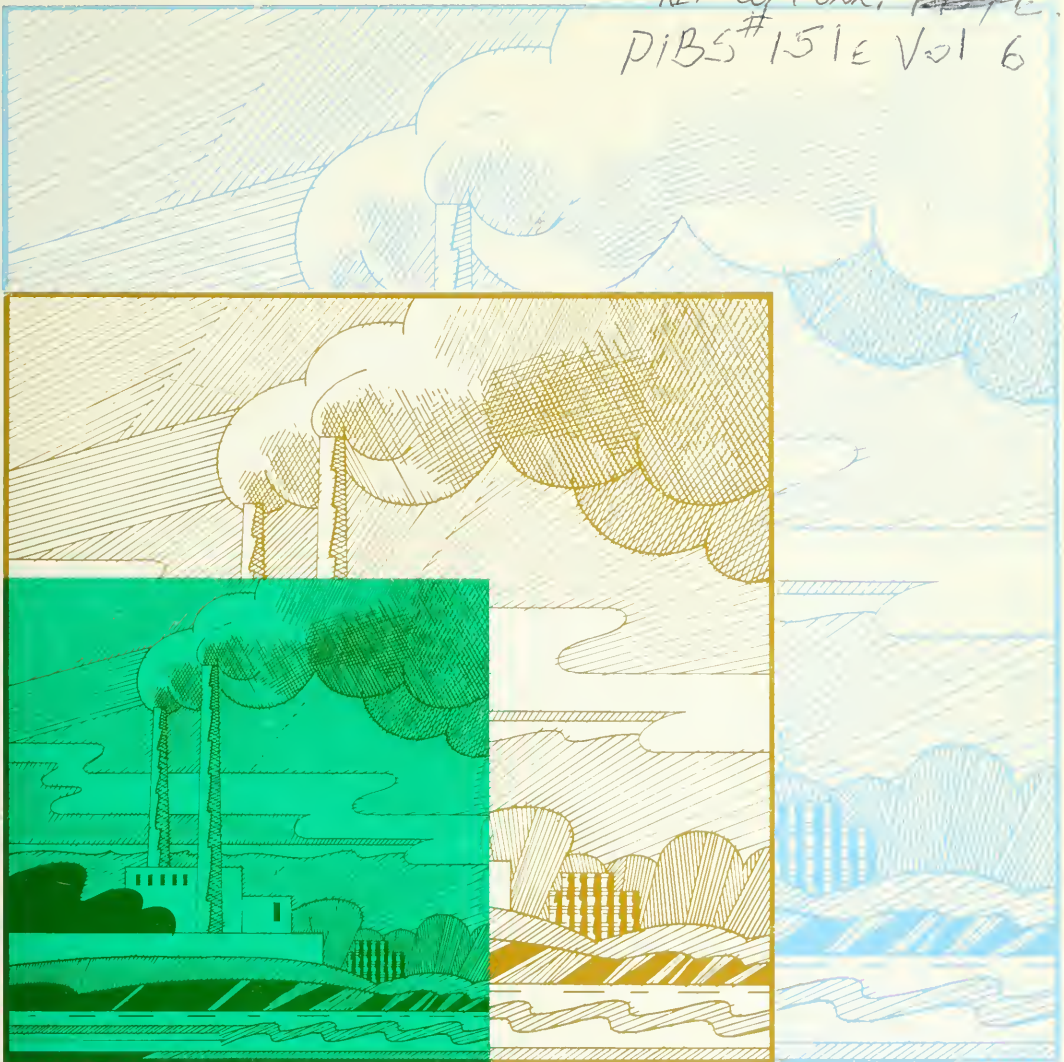




38th
Ontario
Waste
Management
Conference

June 16 - 19
1991
The Prince Hotel,
Toronto, Ontario

Proceedings



Environment
Ontario



**Proceedings
of the
Thirty-eighth
Ontario Waste Management Conference**

held at

**The Prince Hotel
Toronto, Ontario**

June 16 - 19, 1991

**Sponsored by the
Ontario Ministry of the Environment**

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PREFACE TO THE PROCEEDINGS OF THE 38th Ontario Waste Management Conference

Following are the full texts of the papers presented at the 38th Ontario Waste Management Conference. It is your permanent record and reference resource of the thoughts and insights proffered by the authors. Share it with your associates.

Despite the recession and other debilitating influences, the 1991 Waste Management Conference was as successful as expected. Total registration numbered 360, and a new high in paper presentations, 25, was achieved. On behalf of the Ministry of the Environment, and the Planning and Program Committees, thank you for your continuing support of the Conference and your individual participation in the information exchange.

As has been the case in the past, we are indebted to the session moderators and the authors for their significant contributions to the program. The papers, content, audio-visual supplements, the speakers, and the session management of the moderators, allowed all delegates ample opportunity to exchange views and compare notes on the environmental problems that confront this province and country at the present time. As a result of this interchange, we all should have some new insights into formulating specific action plans in the field of environmental protection.

I would be remiss if I personally did not thank the members of the Planning and Program Committees for their contributions to the staging of the Conference. Included on the Program Committee are designates from the Pollution Control Association of Ontario and the Air and Waste Management Association. The addition of external representation on the Committee has aided considerably in formulating our program to appeal to the largest possible audience. This contribution is much appreciated by both the Ministry and the delegates.

In my opening remarks at the Conference I heralded the 1990's as the years of and for the environment. The general consensus of those who attended the 38th Conference was that it was a very good start in our efforts to achieve this objective. The second step in this progression will be the 39th Ontario Waste Management Conference which will be held June 14 - 17, 1992 at the Prince Hotel in Toronto. You and your associates are invited to attend.

Hardy Wong
Chairman



ONTARIO WASTE MANAGEMENT CONFERENCE HISTORICAL DATA

Location	Dates	Sponsor
Ontario Agriculture College, Guelph	1954 to 1956	Pollution Control Board of Ontario
Delawana Inn. Honey Harbour	1957 to 1963	Ontario Water Resources Commission, Water & Pollution Advisory Committee
Bigwin Inn, Lake of Bays	1964 & 1965	Ontario Water Resources Commission, Water & Pollution Advisory Committee
Park Motor Hotel, Niagara Falls	1966 & 1967	Ontario Water Resources Commission
Sheraton Brock Hotel, Niagara Falls	1968 to 1971	Ontario Water Resources Commission
Skyline Hotel Toronto	1972 to 1974	Ontario Ministry of the Environment
The Prince Hotel, Toronto	1975 to 1991	Ontario Ministry of the Environment

Conference Chairman	Dates	Secretary/ Co-Ordinator
Dr. A.E. Berry	1954 to 1962	D.S. Caverly M. Grove
D.S. Caverly	1963 to 1973	L.M. Tobias
K.H. Sharpe	1974 to 1976	M.J. Cathcart (1974)
D.P. Caplice	1977 & 1978	
	1975 to 1991	M.F. Cheetham
J.W. Giles	1979 to 1986	
R.M. Gotts	1987	
B.I. Boyko	1988 to 1990	
H.M. Wong	1991	

Program Conveners

1954-1959	A.V. DeLaporte
1960-1973	F. A. Voegelé
1974-1978	J.B. Patterson
1979-1991	R.C. Stewart

**1992 - 39th ONTARIO WASTE MANAGEMENT
CONFERENCE
THE PRINCE HOTEL, TORONTO, ONTARIO
JUNE 14 - 17**



CONFERENCE PLANNING COMMITTEE



Conference Chairman
H.M. Wong,
Director,
Waste Management Branch,
Ontario Ministry of the
Environment



Conference Vice-Chairman
B.I. Boyko,
Director,
West Central Region,
Ontario Ministry of the
Environment



Program Convener
R.C. Stewart,
Manager, Special Projects
West Central Region,
Ontario Ministry of the
Environment



Conference Co-Ordinator
M.F. Cheetham,
Ontario Ministry of the
Environment



TECHNICAL PROGRAM COMMITTEE



D. Crump, Operations
Co-Ordinator, Regional
Operations Division, Environment
Ontario, Toronto



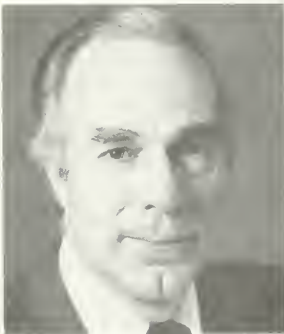
M. Greenfield
Dofasco, Hamilton
for Pollution Control Association of
Ontario



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Abatement West, Central
Region, Environment Ontario,
Toronto



J.D. Kinhead, Manager, Watershed
Management Section, Water Resources
Branch, Environment Ontario,
Toronto



J. Jeffries, Supervisor, Vehicle
Emissions Unit, Air Resources
Branch, Environment Ontario,
Toronto



G. Rocoski, Manager, Waste
Management Policy Section,
Waste Management Branch,
Environment Ontario, Toronto

Other members of the Committee included: A. Davies, RWDI, Guelph, for the Air and Waste Management Association; D. Onn, Waste Reduction Office, Environment Ontario, Toronto; and J. Zend, Emission Tech and Regulation Development Section, Air Resources Branch, Environment Ontario, Toronto.



THE PAPERS AND THE AUTHORS
at the
38th ONTARIO WASTE MANAGEMENT CONFERENCE
JUNE 1991
TORONTO, ONTARIO

THE PAPERS AND THE AUTHORS

at the

38th ONTARIO WASTE MANAGEMENT CONFERENCE

JUNE 1991

TORONTO, ONTARIO

SESSION I - ENVIRONMENTAL OVERVIEW



Moderator: Julyan Reid, Assistant
Deputy Minister, Operations Division
Environment Ontario, Toronto



The Honourable Ruth Grier
Ontario Minister of the Environment



Erv McIntyre, General Manager
Interim Waste Authority, Greater
Toronto Area



Bonnie Wein, Director, Legal Services
Branch, Environment Ontario,
Toronto, Ontario



The Honourable David Crombie,
Royal Commissioner,
Toronto, Ontario



Colin Isaacs, Consultant
Contemporary Information Analysts,
Stoney Creek, Ontario



MINISTERIAL UPDATE AND FUTURE CHALLENGES - ON THE ROAD
TO A CONSERVER SOCIETY

by
The Honourable Ruth Grier, Ontario Minister
of the Environment

Good morning: It is a pleasure to be here today as we start the 38th annual Ontario Waste Management Conference.

In one form or another, this conference has served as the launching point for a wide range of pollution control initiatives in Ontario over the past 38 years. The people attending have contributed in many ways to resolving the environmental issues raised here.

The agenda today covers a wide range of issues. The speakers have a lot of ideas and insight to offer. Each of us attending this year is involved in our own way in restoring and protecting our environment.

There is so much to do! This morning, I want to set out for you some of the guideposts I see that can lead us on the road to change from a consumer to a conserver society -- a road down which we have started, but have much further to travel.

I want to review some of the assumptions under which we have operated and how they are changing, some of our achievements, new priorities and initiatives, and basic principles under which a workable conserver society can be established.

Changing assumptions

Conserving is a significant change in direction for this society. When the first Europeans settled on this continent, they started what seemed like unlimited economic growth. For more than four centuries we built a society whose prosperity was based on resource extraction, efficient production, distribution and consumption, and waste disposal.

We competed to see who could run fastest through this process of extraction, production, use and waste.

With this prosperity came some basic assumptions:

- New is better than used.
- If we throw it away it is garbage.
- The faster we produce, consume and discard, the more prosperous our lives will be.

We have since discovered:

- That new is not better than used if we run low on new material and can not get rid of the old.
- That what we discard stays to contaminate our air and water and use up our land, and
- That accelerated consumption simply uses up our resources faster.

Socially and economically, we have been living off our capital, depleting both our resources and our environment. We have all come to realize now that we must at the same time compete and co-operate in a new social investment strategy that will sustain the quality of our

lives without depleting our environmental or resource capital.

That strategy is inherent in a conserver society and I think we have already taken our first steps down that road. More and more, we are turning away from the concept of simply waste management and thinking instead of the efficient use of the material resources that we enjoy in this province.

As we ended the 1980s, Canadians generated 1.7 kilograms of municipal solid waste per person per day, with the United States and Australia trailing close on our heels, according to the federal government's State of the Environment Report. In the Greater Toronto Area, we produced three kilograms per person, almost double the national world record.

The bright side to this is that the total waste tonnage disposed of in Metro landfills in 1990 was actually reduced by 3.3 per cent from 1989. We want to see more waste reduction -- much more -- but we have definitely seen a turning point, a point that begins to shut the door on the consumer society of the 1980s.

Achievements

Our greatest gains, so far, have been in recycling through the Blue Box Program. Last year's Ministry of the Environment assistance grants, by the end of March, 1991, had helped establish 179 municipal recycling projects serving more than 410 municipalities. We estimate that the projects are diverting 340,000 tonnes of material from disposal.

Blue box recycling in Metro Toronto is currently diverting 75,000 tonnes of single family residential waste and the region has started to bring recycling to apartment dwellers. The region has also eliminated 38,000 tonnes of waste through municipal composting of leaves and yard waste and started an ambitious program for home composting.

The ministry has provided close to \$7.5 million in assistance to Ontario municipalities to get

300,000 home composters in people's backyards. I am sure that continuing promotion will encourage even more public interest in this type of waste reduction.

We have set aside \$43 million this year to help with municipal capital and operating costs in blue box projects and more than \$12 million to expand the use of home composters.

Our municipalities are showing a lot of enthusiasm and creativity in developing the potential of the blue box.

- In Trenton, Quinte Region Recycling is recovering old corrugated cardboard, boxboard and rigid plastic in addition to the normal range of blue box materials.
- Peterborough is doing pilot studies in effective fine paper recovery and in the feasibility of recovering plastic film, such as grocery bags and food wrap, through the blue box.
- Scarborough is testing a dome-type igloo container for bulk collection of recyclables from 48 multi-residential buildings in their city and East York.
- Ottawa is working with local charities in recovering used clothing, with some recovered for sale in a local Thrift Store and the balance baled and sold through brokers.
- In the township of Archipelago on Georgian Bay, a barge is collecting "white goods", in an attempt to retrieve, repair and reuse every old refrigerator, freezer, washer, dryer and stove to keep them out of disposal sites.

The list goes on.

We are not standing still in our industrial waste diversion program either. We have

committed \$51 million to 280 separate projects by industries, businesses and institutions. This has the potential for diverting more than 1.2 million tonnes of useful material from disposal.

They are recovering chlorofluorocarbons that would otherwise thin the Earth's ozone layer, toxic chemicals, corrosives and solvents, foundry sand, plastic and rubber, packaging materials, demolition debris and a host of other useful materials.

In recycling, this province is setting a record. The program is rooted in a partnership consisting of environmentalists, industry, labor and municipal and provincial governments and we can all be very proud of what the blue box represents. It was a big step and did more than any other initiative to focus public attention on the waste issue.

I hope to build on these strengths and create conditions which favor continued success.

New priorities

Our goals, however, are far-reaching. A 25 per cent reduction in the amount of waste going into our disposal system by 1992 and a 50 per cent reduction by 2000 are minimums. As I have said before, we need a much more aggressive approach to waste reduction.

I cannot stress too often that we also need to set our priorities straight in the 3Rs, to put a greater emphasis on reduction, followed by reuse, with recycling in third place. It is time for us to go far beyond recycling, and to move quickly to further limit the amount of waste we generate.

We have to find ways of drastically reducing waste at source. We must learn to reuse things rather than throwing them away.

When we've gone as far as we can go on reduction and reuse, then and only then is recycling

should have only a small amount of residual waste left to go to our disposal system.

The action plan

Last February 21 I announced a new Waste Reduction Action Plan for Ontario. This plan lays out a course of action that should make it possible for us to meet those 25 and 50 per cent minimum targets on time.

- We will implement strong regulatory measures to reduce at source the flow of valuable resources now going to disposal;
- We will develop the necessary financial and technical systems to divert these materials from landfills and into productive use and reuse;
- We will help to create healthy markets for material recovered through 3Rs programs; and
- We will establish public education programs that will provide all members of Ontario society with the information they need to make responsible 3Rs choices to reduce waste.

Together, the provisions outlined in the plan demand more of everyone in Ontario, from individual householders to municipalities, retail establishments, large and small industrial plants and institutions.

We are strengthening our waste management resources. The new Waste Reduction Office is now developing and preparing to implement the programs and systems to make the Waste Reduction Action Plan really work.

We are prepared to deal effectively and swiftly with the mounting pressures created by our reliance on garbage disposal, especially in the Greater Toronto area, where immediate and decisive action is required.

The GTA initiative

The five regions which make up the Greater Toronto Area concentrate massive waste production in a relatively small area. This area represents the greatest challenge we face in waste reduction, but also provides one of our best testing grounds for developing and refining new solutions.

Last April, I announced that we would not permit the GTA to transport its waste outside the GTA. This was a difficult decision and, of course, one that was not met with universal enthusiasm. But it was the only decision I felt I could make with environmental integrity. We should not be sending garbage from one end of the province to another. I have not been persuaded that it would make either environmental or economic sense.

Instead, I have taken steps to establish a new authority, with the responsibility for finding new long-term landfill capacity for the GTA within the GTA where some 40 per cent of Ontario's solid waste is produced.

Until the authority and related legislation is in place, I have directed an interim staff team to initiate the process of finding longer term landfill capacity -- enough to last the GTA many years. I have directed the interim team to focus the search effort on finding three landfill sites, one in Peel, one in Durham and the third, within the boundaries of Metropolitan Toronto and York, to serve those two regions.

The process for evaluating alternative sites will be consistent with the improvements we are developing in the current consultations on the environmental assessment process. I think you will also find the process to be a more effective and less frustrating approach which deals

with realistic waste management options.

Some of the traditional pollution control techniques and waste management strategies are merely redistributing risks, either from one geographic area to another, or from the present time until some time in the future, rather than tackling problems and solving them at the source of generation.

Incineration

Incineration is one such traditional approach that takes high volumes of potentially reusable or recyclable materials and burns them to contaminate the air in local and downwind communities. Incineration is not only inconsistent with the 3Rs, it is a superficial solution which does not attack the root of the problem: We must waste less.

Incineration does not make waste disappear. Between one quarter and one third of the original weight of material entering the incinerator remains as bottom ash and fly ash, posing a threat to human health and the environment. This toxic residue still has to be put in a hole in the ground.

I have dealt with this redistribution of risk by banning all future municipal solid waste incinerators in Ontario. In addition, we have begun to review the Certificates of Approval, as well as the monitoring requirements, for the six incinerators either currently burning municipal solid waste or already approved for future operation. We will be tightening emission standards and ensuring that potentially recyclable and reusable materials do not go up in smoke.

No short cuts

We must turn away from the superficially easy answers and find solutions to our waste problems that will work in the long term. While we may have to allow a limited amount of

short term waste hauling, as we did, reluctantly, with Kingston and its surrounding townships, for long term solutions, we must find ways for each area to dispose of its own waste instead of sending it elsewhere. Each area, therefore, must take responsibility for its own 3Rs program.

I am convinced that we can find the answers to our waste problem in the 3Rs, with a major and increasing emphasis on reduction, so that we stop producing the mountains of garbage we are generating today.

Waste reduction is the key to success in changing a consumer society into one that conserves. There are principles which, I believe, are essential to the conserver society:

Conservation:

The first principle of a conserver society has to be conservation -- minimum use of materials and energy both in the goods and services supplied and in the packaging and systems that deliver them.

More efficient use of materials is effective in waste reduction -- reducing the weight and volume of products, containers and packaging. Our packaging industry, for example, has taken steps in this direction with lightweight cans and bottles. And the potential, for this and other industries, has barely been tapped.

Similarly, we can consider energy efficiency. There's no free ride for raw materials to the factory, for finished goods to the shops and our homes, or from our homes to a landfill site. Distance increases both costs and environmental consequences.

Durability:

Durability in goods can be a significant contributor to the conserver society. A

durable product outlasts its flimsy alternatives. The consumer cycle involves resource extraction, manufacturing, marketing, use and disposal. The cycle is broken, or at least extended significantly, when the product in use is maintained and repaired rather than thrown away. Less valuable material is discarded and the loss of employment in resource extraction is counterbalanced by continuing employment in a service industry.

True cost accounting:

The true costs involved in dealing with wastes must be assessed when decisions are made between reduction and disposal alternatives. Traditionally, tipping fees at landfills and other disposal costs do not take into account the real social and environmental costs involved. When the expenses of planning and siting a landfill, the damages that accrue to the community and the environment and the losses in material resources are factored in, we can see the real economic sense of waste reduction, reuse and recycling.

Accountability:

Accountability begins with individuals and the decisions we make. We recycle where we live, work and play. We compost at home. We influence the marketplace as well as reducing waste when we choose the reusable product over the disposable.

It continues when a business or industry takes stock of its systems and processes to eliminate waste in production, distribution and marketing, and to recycle and reuse paper and other materials being wasted internally. Accountability extends to the community -- municipality or region -- that adopts the conserver view. This includes effective recycling and composting programs. The concept also extends to dealing with materials within the community rather than discharging them as wastes beyond our borders. This principle is a major factor in our efforts to ensure that the Greater

Toronto Area closes the loop to contain these materials.

Product Stewardship

Product stewardship, the responsibility a manufacturer, brand owner or seller bears for the environmental impact of a product or container on the community, is another aspect of being accountable. This will be a significant factor as we deal with waste reduction, particularly in packaging areas.

In this vein, if products are manufactured with due regard for the integrity and future use of the materials that go into them, then we have a massive head start on reusing and recycling those materials.

Self interest:

Self-interest is also a factor and can be a positive one. When a community and its residents know the wastes they generate will remain with them, then self-interest can produce positive results in terms of buying decisions, waste reduction, product and container reuse and recycling effort. The prospects of ever-increasing disposal costs and environmental consequences to their immediate community are strong motivators.

Social involvement:

Accountability and self interest are forces in personal decision making that can and should be harnessed in community decisions. There must be ample opportunity for people, as individuals and groups, to get information and influence environmental decisions, such as waste sites, that can affect their interests.

This in turn improves the quality of government decisions by involving local expertise and arousing the self interest and accountability of the people who make up the

various levels of government.

Applying the principles

Putting these principles to work is both an opportunity and a challenge. Basically, we must stop being wasteful. The ideal, in a conserver society, is to replace waste management with resource management. There will always be some leftover wastes for which no immediate use can be found. They will be a continuing reminder and challenge to our enterprise and ingenuity.

But the more we manage a closed loop of materials for use and reuse, the closer we come to protecting our environmental and resource capital.

As we move in this direction, I think you will find that there are solid, practical advantages, to resource management planning over waste management planning. While we are still discussing various detail with municipalities and others, this is how I would like to see municipal resource management planning proceed:

Firstly, a municipality would be expected to develop a waste reduction action plan that takes full account of the 3Rs options that are available to provide maximum reduction. This should, of course, leave room for new 3Rs initiatives and opportunities for further waste elimination.

When this process is complete, the municipality, as a separate study, can begin identifying and evaluating landfill sites. At this stage, waste reduction plans are completed. I have, for solid environmental reasons, already eliminated incineration and transportation of wastes to outside communities. The improvements I expect to announce this year to the environmental assessment process could operate in a much more effective way in waste management, narrowing the potential areas of dispute and reducing substantially municipal frustration with the current costly process.

Creating a conserver society is not only a political or legislative issue. It is, rather, environmental, social, economic and even biological when you consider the consequences of resource depletion.

The challenge calls for environmental, social, economic and "people" solutions. Political and legislative authority must set the framework for solutions and then be prepared to reinforce, support and expedite action at all levels.

You will see some careful team building and thorough consultation on the part of our Waste Reduction Office as we start to travel the road to a conserver society.

We will be looking for ways to increase the effectiveness and the reach of the 3Rs. We will be measuring the barriers and prejudices impeding the use of secondary materials. We will search out the habits and processes that have been encouraging waste to see how they can be adapted to serve conservation -- to build a system that prefers used material over virgin resources, reuse of products rather than remanufacturing.

We will want advice and assistance in the challenge of re-educating an entire society to unlearn old habits and establish new behavior patterns.

We need help from you and from thousands of others, with the broad collective range of expertise you can offer, to produce results that are positive environmentally, socially and economically.

DEVELOPMENT OF THE ENVIRONMENTAL BILL OF RIGHTS

by
Bonnie Wein, Director, Legal Services Branch,
Ministry of the Environment, Toronto,
Ontario

The concept of an Environmental Bill of Rights is not new in the Province of Ontario. Since 1979, numerous Environmental Bills of Rights have been introduced by various parties in opposition. Over the past decade, some of the concepts encompassed by Environmental Bill of Rights legislation have been separately enacted in this province; these include various aspects of Environmental Assessment and planning, Intervenor Funding, and Freedom of Information. Other concepts such as Class Actions and standing rights are being considered in omnibus legislation at the present time.

The current Ontario government has made a firm commitment to environmental principles. One of the principles as outlined the Throne Speech of November 1990, is that individuals should have greater control over the quality of their environment. To ensure this, there must be right to seek legal action to redress environmental harm.

The current government is committed to introducing an Environmental Bill of Rights. The Bill will address the following principles:

- First, the public's right to ensure a healthy environment;
- Secondly, the enforcement of this right through improved access to the courts, including the right to sue polluters;
- Thirdly, increased public participation in environmental decision-making;
- Fourth, increased government accountability for the environment;
- Fifth, greater protection for employees who "blow the whistle" on polluting employers.

This paper will review the process by which the current government has commenced the development of the Environmental Bill of Rights, and will review some of the substantive areas assessed by the Minister's Advisory Committee on the Environmental Bill of Rights.

The Advisory Committee Process

In December of 1990, the Minister of the Environment, Ruth Grier, named an Advisory Committee on the Environmental Bill of Rights. The Committee consisted of representatives of all major segments of society, mandated to review the principles to be incorporated in the Bill. While the Minister had, as an opposition member, introduced private members Acts respecting environmental rights, it was decided that a thorough public review of the principles to

be addressed by such a Bill would provide more useful information to the Minister. Bill 12, the most recent of the Private Members' Bill, was accordingly not taken as a starting point by the Committee. Rather, the Committee addressed various principles to be incorporated in the Bill.

The Advisory Committee was a large committee, comprised of 26 organizations whose representatives were able to bring a broad range of community interests forward for consideration. The mandate of the Committee was to work as a purely consultative group; however, on some topics the Committee expressed a desire to work towards consensus, and in some instances the Committee was able to provide the Minister with a relatively unified position on particular principles. On each issue, expert lecturers made presentations to the group, and a discussion period followed. The Committee also held a number of working sessions where various options were considered in detail.

Working concurrently with the Advisory Committee was an Interministerial Committee formulated of representatives of the Legal and Policy Branches of various Ministries which would potentially be affected by the Bill, including the Ministries of Environment, Natural Resources, Northern Development and Mines, Agriculture and Food, and Municipal Affairs. This Committee considered what impact various options would have on existing legislation, what needs should be addressed by the Bill and financial impacts of various principles.

At the same time written submissions were solicited from the Public. Over 200 responses were received from individuals and interest groups. These were summarized under various topics, distributed to the working Committees, and will be taken into account in the preparation of the Bill.

The Advisory Committee was able to fulfil its purpose of providing the Minister with a full range of views, by giving her consensus views on some topics, the benefit of wide-ranging views on other more contentious topics, and further assistance with respect to the appropriate next steps in the development of the Bill.

What follows is a brief overview of the complex and varied issues which were discussed by the Advisory Committee, and a summary of the conclusions reached by that Committee.

Key Issues

1. The Definition of "Environment"

In Ontario legislation, there are presently two definitions of "environment". The Environmental Protection Act uses a restricted definition of "air, lands and waters" whereas the Environmental Assessment Act uses a broad definition which includes the economic, social, cultural, historic and aesthetic aspects of the environment as well as the built environment. Bill 12, the Environmental Bill of Rights proposed by the present Minister of the Environment while a member in opposition, adopted the broad definition. Concern was expressed that this very wide definition was over-inclusive and that its subjective elements could be problematic if it was used to form the basis of liability.

The Advisory Committee generally was of the view that a narrower definition of "environment" than that in Bill 12 was better suited to meet the "ecocentric" focus of the Bill. It was agreed that the definition should include air, land, water and natural resources and their ecosystems. Human, animal and plant life are part of the environment to the extent that they comprise, in part, the ecosystem. The built environment per se would be excluded. This definition would be similar to that adopted by the Northwest Territories in its Environmental Rights Act, which came into force on November 6, 1990.

2. The Purposes of an Environmental Bill of Rights

The purposes of the Bill were canvassed within the Advisory Committee and were determined to include the following:

- to protect and conserve a sustainable environment
- to empower the public to act to protect the environment
- to make government more accountable for its decisions affecting the environment

The issue of the Bill's purpose was closely tied to the issue of paramountcy: should the Bill be paramount over all other Ontario legislation in the event of conflict? In general, it may be said that the environmentalists want the Bill to have paramountcy whereas the business community and other specialized interest groups do not.

3. The Rights the Bill Should Provide

The issue for discussion concerning the rights to be provided by this legislation was whether the Bill should provide a substantive right to environmental quality (such as a "healthy"

environment) or provide procedural rights enabling the public to act to protect the environment in specified ways. Again, differing views were expressed within the Advisory Committee. In general, the environmentalists favoured a substantive right to environmental quality whose content and remedies would be determined by the courts in much the same manner as the Charter of Rights and Freedoms operates. The business groups and the agricultural community favoured the certainty which would be provided by specifying the procedural rights with precision.

4. The Doctrine of Public Trust

The Advisory Committee considered whether the Bill should include a doctrine of public trust, as in American precedents, specifically the Michigan Environmental Protection Act (MEPA). The doctrine is relatively novel in Canadian jurisprudence and would have the effect of making the Ontario government a trustee of the province's public lands, waters and natural resources. The government could then be considered to be accountable to any citizen in the province for the exercise of its fiduciary obligation to "conserve and maintain" these aspects of the environment.

Certain members of the Advisory Committee expressed concern related to the fact that the doctrine is novel and uncertain in Canada and has the potential to significantly enlarge government liability or accountability. Some members were concerned that the doctrine would impair government's ability to govern or paralyze government decision-making. It was suggested by some members that the objective of the doctrine - government accountability - could be better achieved by more traditional methods than by invoking this new legal concept. Others noted that the doctrine had not had negative effects in the American jurisdictions. Land use environmental groups suggested that the doctrine was an essential aspect of the Bill if government was to be made more accountable for its decisions affecting the use of natural resources and development. This issue remains a fundamental issue on which strong differing opinions are held.

5. Enforcement Measures

The Advisory Committee looked at a range of enforcement measures which the Bill could provide.

There was general agreement that the Bill could usefully include a "Request for Investigation" similar to that in the Canadian Environmental Protection Act. This would enable two persons to request, by affidavit, that the government investigate an alleged environmental offence and report in writing as to the results of

that investigation. Various thresholds for triggering the request for investigation were considered. Some thought that the threshold needed to be an alleged environmental offence; otherwise, the number of such requests could be so great that it could force a reallocation of resources within government and restrict government's ability to set its own agenda. Others thought the threshold should be lower, enabling any two persons to make a request where they believed that the environment was being contaminated or degraded.

Environmentalists supported the inclusion of a Citizen Suit, such as that used in the Clean Water Act, the Clean Air Act (as amended in 1991) and other American federal and state legislation. These suits would permit persons, on notice to the government, to bring civil actions against environmental offenders for civil penalties or for injunctive relief. Such actions may only proceed where government, having been notified of the alleged offence, chooses not to enforce the existing applicable law. Generally, in the American context, funding or costs provisions are available as incentives to litigate by way of a citizen suit.

Other members of the Committee saw the Citizen Suit as an alternative to the Request for Investigation and accordingly felt it was unnecessary if a Request of Investigation provision were included. These members did not view the cost, delay, complexity and uncertainty of the judicial process that the citizen suit model relies upon as attractive.

The most contentious area relating to enforcement measures that the Advisory Committee had to consider was the issue of the right to sue a polluter. This issue must be considered in the context of other legislation currently being developed in Ontario. The Ministry of the Attorney General is presently examining the issue of standing with a view to introducing omnibus legislation liberalizing the present law. The issue before the Committee was this: would the existing rights of action in, for example, tort, negligence and nuisance, once made more accessible through new standing laws, appropriately serve the needs of public interest environmental litigators?; or would a new cause of action for environmental harm, including liberalized standing, be necessary or useful?

The issue is a complex one. The effects of an impending Class Action law and the existing Freedom of Information and Intervenor Funding legislation must also be calculated in order to determine which alternative is preferable.

The environmentalists were generally of the view that a new cause of action was necessary. They argue that this new right to sue environmental degraders and polluters should be specifically

tailored to promote environmental actions and to address the deficiencies in the existing law of evidence. More particularly, the rules respecting proof of causation should be relaxed and the burden of proof should be shifted to the defendant, as was done in the Michigan Legislation. This aspect raises further issues, because of our Canadian Charter of Rights, which may restrict the extent to which the onus of proof can be shifted to the defendant. These members of the Committee were of the view that the right to sue would be used only in the last resort, when all other efforts had failed.

The business and legal representatives were on the whole strongly opposed to the inclusion of a new right to sue in the Bill. Business raised "certainty" concerns and questioned whether there would be an absolute defence of statutory compliance. If not, business questioned how this new right to sue would mesh with the existing regulatory framework in Ontario. The legal community was concerned that existing laws relating to evidentiary burdens of proof and causation not be tampered with and also that extra-judicial solutions for resolving environmental disputes be fully explored.

Many issues remain to be resolved in this area. The Committee did agree that the interaction of the new standing law, new Class Action legislation and the existing law, as well as a new Environmental Bill of Rights, would require intensive further analysis.

The members of the Committee also agreed that any damages for environmental harm ought not to be paid as a windfall to a private plaintiff, but rather ought to be directed specifically towards environmental remediation.

6. Public Participation

This was the area of greatest consensus in principle among Committee members, although much further work is necessary to ensure smooth and effective implementation. All members of the Advisory Committee agreed that there was a need for improved access to information and greater participation by the public in environmental decision-making. This would, in turn, promote the objective of greater government accountability. To implement this principle, provisions relating to notice and comment, and possibly the right to a public hearing in certain specified types of cases, were discussed. The Committee agreed that such provisions should be included in the Bill with respect to all new environmental regulations and the issuance of significant environmental instruments. It was also agreed that there should be a means for a citizen to petition government for the review of existing standards in regulations and instruments and a means to request that government put a regulation or instrument in place

where none currently exists. There was considerable debate within the Committee as to what the appropriate limiting criteria should be, given that the instruments potentially involved numbered in excess of 3.9 million and were administered or issued by five separate ministries. Implementation mechanisms were not considered in any detail.

7. Public Reporting Mechanisms

The Committee reached agreement that a Biennial Report would meet the basic information needs of the public. The establishment of a central registry of environmental instruments and regulations was also recommended.

8. "Whistle-Blower" Protection

Another area discussed by the Committee was the extension of existing "whistle-blower" protections and the provision of an employee's right to refuse to pollute. Ontario's environmental legislation currently provides protection for "whistle-blowers" who report a contravention of environmental laws. By incorporating these provisions into the Environmental Bill of Rights, the protection would be extended to workers reporting offences under any of the scheduled Acts to the Bill.

The right to refuse to pollute would be new in Ontario although the right to refuse to work in an unsafe workplace is recognized in the Occupational Health and Safety Act. Some members of the Committee expressed reservations as to how this new right would be implemented and commented on its potential for negative effects on business operations.

Summary

This brief overview indicates the complexity of the issues which were addressed by the Advisory Committee and the divergent views that the process elicited. That the Committee was able to reach agreement in certain significant areas suggests a general acceptance of many of the principles underlying the Bill. On other issues, further consultation with an informed public will be appropriate in formulating the legislation.

One of the strongest views on which the Advisory Committee reached consensus was that more time was required for the development of the Bill. The complexity of some of the issues encouraged even those groups who urgently support passage of the Bill to request to the Minister that more time be given to allow for public participation in the development of the Bill, and the

assessment of how it would interact with other legislation being developed by this government, especially the Attorney General's Standing legislation (which also remains in Committee).

The Advisory Committee did lay an important foundation for development of the Bill. The certainty is that the Bill will have a large and continuing impact on ways in which each citizen of the province will be empowered to ensure protection of the environment.

LANDFILL SITING - THE INTERIM WASTE AUTHORITY
PROCESS

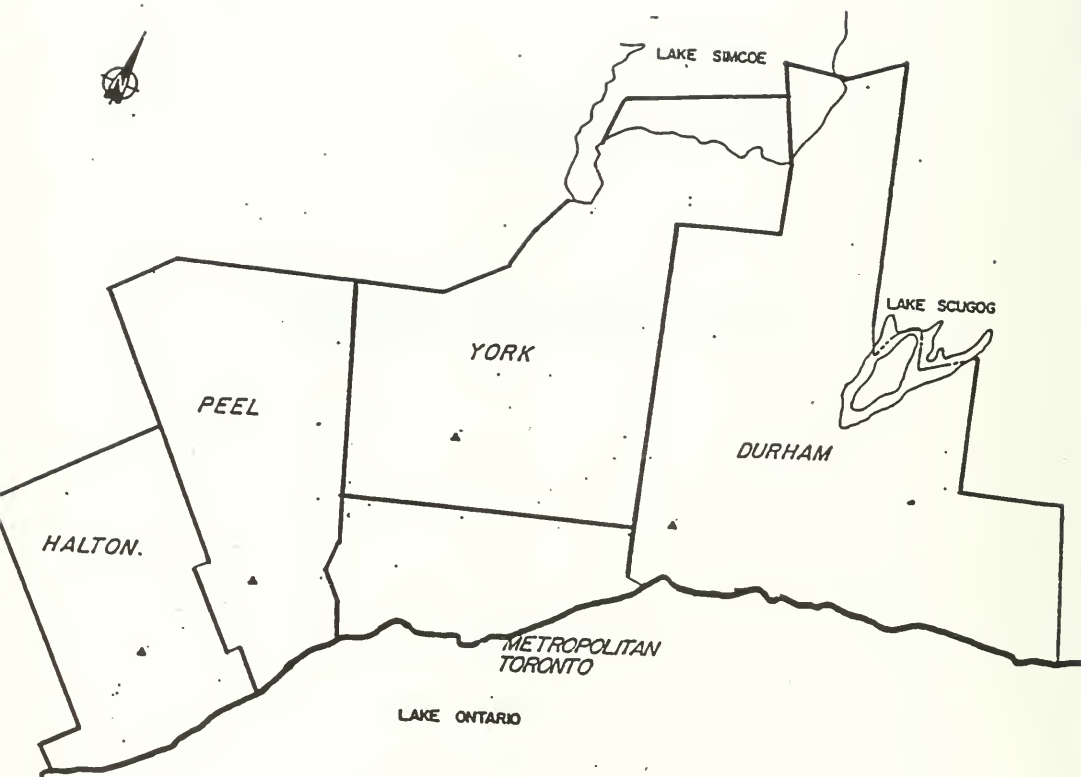
by

C.E. McIntyre, General Manager, Interim Waste
Authority, Greater Toronto Area, Toronto

Mr. McIntyre did not have a prepared text of
his address. He spoke from slides, the text
of which follows.

INTERIM WASTE AUTHORITY

1. Mandate
2. Organization
3. Site Search Plans



INTERIM WASTE AUTHORITY

MANDATE

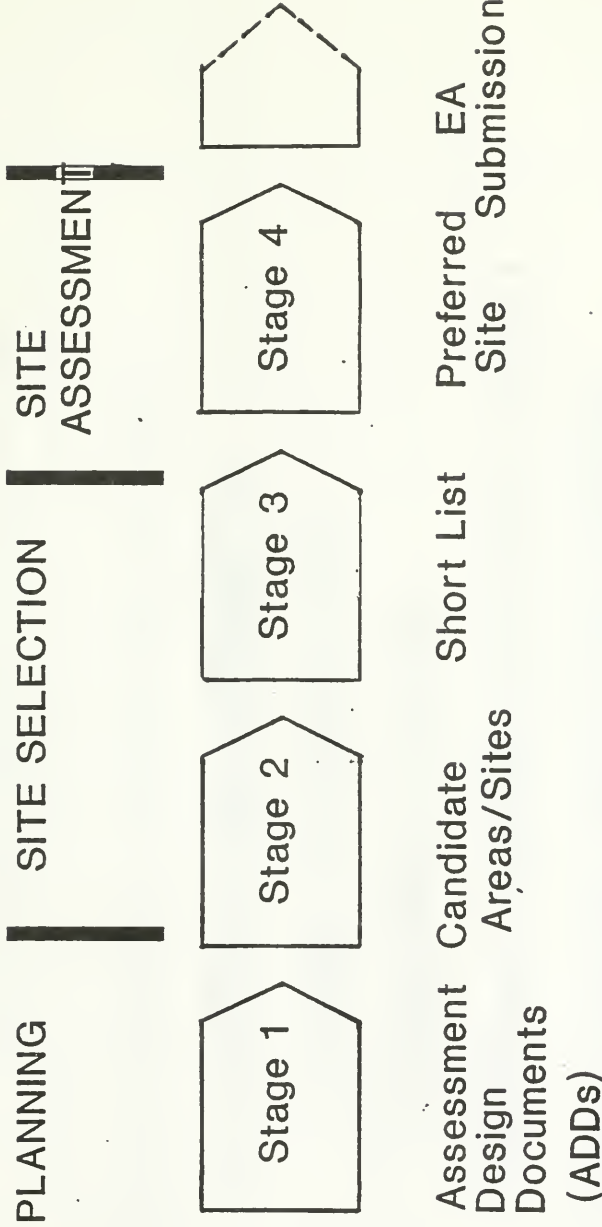
- 3 Landfills
 - Peel
 - York/Metro
 - Durham
- Long Term Capacity (about 20 years)
- Principles of Environmental Assessment Act

INTERIM WASTE AUTHORITY

Principles of EA Process

- Consult with affected parties
- Consider reasonable alternatives
- Consider all aspects of the environment
- Systematically evaluate net environmental effects
- Provide clear complete documentation

SITE SEARCH PROCESS



INTERIM WASTE AUTHORITY

What's different about this process?

1. Assessment Design Documents (ADDs)

- site search process
- public consultation plan
- issues to be considered

INTERIM WASTE AUTHORITY

What's different about this process?

2. Guidance on alternatives "to"

- Study Area
- Incineration
- 3Rs

INTERIM WASTE AUTHORITY

What's different about this process?

3. Effectiveness & efficiency

- streamlined process
- dedicated review

For More Information:

Interim Waste Authority
Waterpark Place
20 Bay St., Suite 1625
Toronto, Ontario
M5J 2N8

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THE FUTURE OF TORONTO'S WATERFRONT

by

The Honourable David Crombie,
Royal Commissioner,
Toronto, Ontario

Mr. Crombie did not have a prepared text for his address to the Conference.

At the conclusion of his "off-the-cuff" remarks, the speaker invited those attending to write to him personally if interested in obtaining a copy of the Commissioner's Report. The address is: The Honourable David Crombie, c/o Metropolitan Toronto Clerk, 390 Bay Street, 5th Floor, Toronto, Ontario M5H 3Y7.

ENVIRONMENTAL AUDITING

by

Colin Isaacs, Consultant,
Contemporary Information Analysts,
Stoney Creek, Ontario

It is a pleasure to be with you today to talk on the theme of environmental auditing in the context of waste management. I am going to start by trying to come to grips with defining this new activity that we call the environmental audit. When I have done that I am going to lead you on a quick audit of a local modern municipal landfill and, if time permits, I will wrap up by attempting to locate the environmental audit as a component of the new approach that we call sustainable development.

What is an environmental audit? There is even a difference of opinion among those selling the service. Perhaps that is understandable: environmental audits are the new product on the block. As so often happens with new products, the term means different things to different people.

If I wished to be cynical, which I most definitely am not, I would say that accountants have seen the word audit and said *ah ha - here is a new product for us to sell*; lawyers have heard that audits have something to do with compliance and have said *ah ha - here is a new product for us to sell*; and of course engineering consultants are always prepared to sell any service that includes the word "environment". In fact there may be a role for all of those specialties in environmental auditing, though I am sure that it will be no surprise to you that I am of the opinion that a real audit involves environmental and scientific specialists.

The dictionary defines audit as an "official examination of accounts". An environmental audit is an examination of the company's environmental accounts, the environmental debits and credits resulting from the business activity. Given that it is almost impossible to undertake any activity, including breathing, eating and walking, without having some environmental impact, an environmental audit would normally be heavy on debits. Fortunately, for those of us who want to look on the positive side of the ledger, the audit looks at environmental debits and credits not against a bottom line of zero but against a bottom line that is set according to the purpose of the audit. Here is where the confusion arises.

With the increasing concern of directors and officers that they may be held personally liable for the environmental transgressions of their company, one of the most common audits is to determine the compliance of the company with environmental legislation and regulations. Few large companies are free of some kind of violation, sometimes because staff are not adequately trained in current regulatory requirements, sometimes because

managers are scared that they will be fired if they admit the existence of environmental problems, sometimes because people are too proud to admit that they made a mistake and caused an environmental problem. Most often, violations arise through simple carelessness. The environmental liability audit, carried out by outside experts to determine the state of the company's compliance with the law, is almost certainly the best way for directors and CEO's to demonstrate that they are taking their environmental responsibility seriously and thus to minimize their personal liability in the event that government inspectors lay charges. Of course, the audit alone is not enough: the company must be prepared to deal with any problems revealed by the audit in an efficient and effective manner. I might also add as a footnote that I am somewhat disappointed that some companies are treating compliance audits as if they were a major environmental leadership step. Compliance audits simply ensure that the company is complying with the law and I think we should expect compliance with the law from every company that does business in this province.

A couple of years ago there was a great deal of concern in business that compliance audits should not be undertaken because the Ministry of the Environment might seize the results and use them in court against you. The concern has diminished today, but in case anyone is thinking of it, perhaps I should address it. First, my legal friends say that Ministry enforcement officers are very unlikely to seize an audit report. Second, they tell me that the courts are very unlikely to accept it. Third, if you're going to get prosecuted it's a whole lot better if the President knows ahead of time that he's got a problem and that someone is working on it! Bluntly, driving a corporation without knowing whether or not the company is in compliance with environmental laws is substantially worse than driving a car without a speedometer. It won't stop you getting caught and not only is it not an excuse for the violation but it also shows a degree of wanton disregard that may well be used against you when it comes time for sentencing. Unless the CEO knows what's going on, he is much more vulnerable when something blows.

A variation of the liability audit arises when property or business ownership is transferred. Today any prospective new owner should want to ensure that they are not buying any environmental headaches. Audits of past practices are often negotiated as a component of transfer agreements whenever there is concern that the company's toxic wastes may lie buried somewhere.

At the other end of the spectrum is the "green" audit, sometimes called the "green comb". These are usually fairly quick reviews by experienced environmentalists who may not be experts in the company's area of business. The green audit is intended to provide the basis for a corporate "greening" program: adoption by the company of environmental initiatives with which it can impress environmentally conscious consumers. These audits generally look for waste reduction and recycling opportunities, energy conservation measures, and blatant cases of uncontrolled pollution. Following the audit the consultant

and a lot of good feeling that the company really cares about the environment.

Specialty environmental audits are also offered. Two of the most common are waste audits and energy audits. A waste audit is a detailed analysis of a company's wastes intended to find ways of reducing or eliminating discharges from industrial processes. These can be done by outside consultants or by the company's own staff: an excellent industrial waste audit manual, written as a how-to guide and illustrated with case studies, is published by the Ontario Waste Management Corporation. Energy audits are similar, but are designed to seek out ways of reducing the energy used by industrial or commercial activities. Again consultants are available, but funding and audit services are often available through provincial or municipal utilities.

Probably the best kind of audit from my perspective is that which is designed to help the company become an environmental leader in its field. These audits, often carried out by a team of experts covering the disciplines involved in the company's activities, review the company's activities against standards loosely defined as Best Available Technology Economically Achievable (BATEA). As a fully comprehensive audit approach, the leadership audit should include all aspects of other environmental audit types and, with the included development of an action program, it will almost certainly be an ongoing multi-year program for any large company. With government's slowly adopting BATEA standards as the measure for discharges of all types, the company that wants to get ahead and stay ahead needs this type of audit.

One particularly interesting type of audit is the solid waste audit. If any kind of company or institution wants to get a handle on its solid waste, an audit is almost essential. Certainly those who seek to comply with the National Packaging Protocol or the Ontario Minister's target for waste reduction will find a solid waste audit most useful.

In a solid waste audit, garbage that would normally leave your premises and go to landfill is collected instead by the firm of consultants who are undertaking the audit. In their warehouse the garbage is sorted and analyzed. By identifying the precise types and sources of waste present the consultants and the client are able to draw up a waste reduction plan that can achieve maximum results at minimum cost.

In one particular case that I am aware of, the audit discovered that over 30% of single serving packages of such items as ketchup and creamer were being thrown away by patrons of a fast food restaurant without even being opened. By asking patrons whether they would like ketchup or creamer, the operator was able to provide the impression of more caring service, substantially reduce costs, and reduce garbage at the same time. That is just one example of many where waste reduction opportunities discovered by a waste audit have proven especially cost effective.

Garbage has become the focus around which much of our environmental activity is

currently focused and I want to spend a little bit of time imagining the audit of a landfill site. Audits typically look at outputs, in the form of products, air and water emissions, and solid and liquid wastes. They also look at raw materials - the environmental impact of the things that are brought in to the plant. Often, "balance sheets" are used to determine the net environmental impact of some aspect of the plant operation.

Let us imagine a modern landfill site. A fairly straightforward audit. Products: none. Air emissions: burned for energy recovery. We can audit the landfill gas recovery system as a separate item - for now I just want to look at the site. Odour - very little if the site is well-managed. Vermin - a little trouble with gulls, but the environment won't die from gulls. Liquid waste - well, there is the leachate, but if our leachate collection system is effective, most of the leachate is being handled in an environmentally secure way. The leachate which escapes may be contaminating groundwater and we should certainly do everything we can to minimize that. Solid waste - none, except for blowing litter and dust, and proper management can control those. Land use - well, the site can hardly be said to be making good use of land, but shortage of land, except for high quality agricultural land, is not yet one of Canada's most pressing environmental issues. Contamination - the site is certainly contaminated, but today everyone knows that and no one expects to use the site for other purposes. What about the raw materials, the inputs to the facility - unfortunately, the raw materials are, well, garbage.

My point is that landfill sites themselves, properly run properly engineered and sited landfills, are not much of an environmental problem and I think an audit of a modern site would show that. Bluntly, we could go on landfilling Ontario's municipal solid waste for at least another 25 years and the impact on the physical environment of those landfills would be extremely minor when compared to many of the other environmental problems we face. However, when we look at the raw materials for landfill operation we see the real problem - not the landfill, but the garbage. The audit forces us to look at the inputs to the landfill operation and as soon as we do that we see where the real environmental problem lies.

Garbage is an environmental problem because of the resources, the raw materials and the energy that went into manufacture of the stuff that we are throwing away. Let me give some examples: we can reverse the decline of our forests if we stop throwing away so much wood and paper. We can extend the life of our affordable oil reserves if we stop throwing away so many manufactured products. We can reduce our consumption of fossil fuels, and help slow global warming, if we make certain products reusable instead of disposable, because frequently less energy is needed to reuse than to manufacture from raw materials. We also have to consider the manufacturing wastes, including air and water pollution, that are associated with production of all the stuff that we are throwing away. There is almost always less energy required and less pollution created when you manufacture a product out of recycled material than when you manufacture the same product out of virgin raw materials. Recycling and waste reduction programs do much

more than extend the life of landfills: they reduce pollution, acid rain, industrial waste, and climate change and help conserve resources as well.

Disposal of garbage is not the problem. The fact that garbage exists at all is the real problem. By the way, that's why many environmentalists do not see incinerators as a solution. They don't deal with the real environmental problem.

I am sure you are all aware that the Canadian Council of Ministers of the Environment has called for a 50% reduction in waste going to disposal by the year 2000. Interpretations of disposal vary somewhat across the country, but here in Ontario the Minister has clearly included both landfill and incineration as forms of disposal which are to be reduced. Measurement of these reduction targets is still up in the air, but I think it is reasonable to predict that the quantity of waste that we will be allowed to send to disposal will drop significantly within the next five years. Whatever target we choose to set for ourselves, carrying out an environmental audit can help us establish our environmental action plan.

One of the approaches to environmental auditing involves product life cycle analysis: studying the environmental impact of a product literally from cradle to grave. I think time permits me to illustrate the application of scientific and technical principles such as measurement to environmental audits by referring to a couple of examples of life cycle analysis with which we are currently involved.

The first example I want to use is the toothpaste package. Actually we are not researching this product, but because I have to protect proprietary information I have chosen a product for this morning's talk for which the issues are almost identical to the product on which we are doing research.

I am comparing two 100ml containers of toothpaste. One is a pump style dispenser, the other is a conventional tube. The pump is bigger. The traditional theory would suggest that the bigger container is worse for the environment, but when we actually conduct a life cycle analysis we get a different answer. Both packages contain 100ml of toothpaste but when we do tests of these two products in real life family use we find that the pump lasts twice as long as the tube. Why? First, the bead size is smaller, by about 30%. People use toothpaste by length, not by total volume and not by weight. A smaller bead size means that less product is used. Second, the pump provides better control. No toothpaste squirted on the mirror or dripping off the ends of the brush. Just enough to coat the brush and no more.

The pump and its package contain about 50% more material than the tube and its box, yet it lasts twice as long. People are still getting adequate toothpaste, especially as many dentists seem to agree that you don't really need toothpaste at all. Perhaps the pump, which at first glance seemed bad for the environment, is in fact the environmentally

preferred container, all because of dispensing efficiency.

Alternatively, perhaps we can take what we have learned about dispensing control and bead size from the pump to the tube and use the life cycle analysis results to develop an even more environmentally preferred tube type container.

Now that I have got into it, I cannot leave this subject of product life cycle analysis without talking about another of my favourites - disposable versus cloth diapers. Many of you may know that I have been up to my ass in this issue for the last couple of years. Let us look at the life cycle data.

Disposable diapers consume seven times as much raw materials as cloth diapers and produce ninety times as much solid waste. These figures are adjusted for the diaper life of an average baby - you cannot compare diaper for diaper because you generally use more disposables than cloth each day. So we compare of the total diaper life of the baby and we take into account that cloth diapers do wear out. But once you get away from raw materials and garbage you get some comparisons where disposables are less damaging to the environment. Cloth produces more process solid waste, uses about three and a half times as much energy, uses six times as much water, produces ten times as much water pollution, and nine times as much air pollution. All that, and the particular study I referenced for these figures ignores soil depletion caused by cotton crops, water pollution caused by pesticides used on the cotton, and it has a hard time quantifying a wide range of social issues such as providing freedom for women to work and allowing single parent families to obtain full time employment.

I am not going to draw any conclusions about cloth versus disposable diapers. I don't know how to compare water pollution with post consumer waste or air pollution with raw material consumption. Neither does anyone else, though a few brave economists are making a stab at using economic models to compare such diverse environmental issues. I think that generally we have to encourage people to make their own judgements. In areas of the country where water is short, I suspect that disposables do less harm to the environment. In areas where water is plentiful but landfill sites are in short supply, perhaps cloth wins. If disposable diapers were recyclable or compostable the balance would certainly tip much more in their favour.

I have related these two examples to illustrate the complexity of the situation when making environmental decisions, but I also want to emphasize that the issues are not complex when you have the information. You can understand about the toothpaste and the diapers. It is just a matter of knowing the questions to ask and making sure that you get credible answers. The list of issues can be much longer than in my diaper example. Often when conducting environmental audits we have to look at greenhouse gas emissions, ozone destroying substances, toxic wastes, rainforest impacts, pesticide use in raw material production, and much more. But it is still just a matter of asking the

questions and getting the answers.

The United Nations' World Commission on Environment and Development, the Brundtland Commission, gave us the definition of what it described as sustainable development:

Development which meets the needs of the present without compromising the ability of future generations to meet their own needs.

Analysis of the Commission's report can help us understand that the concept includes such common sense ideas as:

- o Pollution is expensive, prevention is much cheaper;
- o Solving environmental problems requires a healthy economy;
- o A healthy economy requires a healthy environment; and
- o Solving environmental problems after they have arisen is more expensive than preventing them before they arise.

The environmental audit can show us where we are causing pollution and wasting money. It can show us the most cost effective pathways to reduce pollution and resource consumption. Because many waste reduction opportunities are tremendously cost effective, and will be increasingly so in the future, an environmental audit can help keep our business or organization economically healthy and implementing the action plan that should be an essential part of every audit will improve the health of the environment as well. For those interested primarily in compliance, having conducted and implemented the results of an audit before the inspectors come calling will go a long way to helping keep you out of jail.

The environmental audit may be the first phase of environment-economy integration as foreseen by the Brundtland concept of sustainable development. Ultimately, environmental audits will be required in order to provide shareholders with environmental information about their companies. Even today an audit is one excellent way through which CEO's and directors can remind themselves that they are as much responsible for the environmental performance of the company as they are for its economic performance.



Moderator: Paul Complin, Director
Air and Waste Management Association
Toronto, Ontario



Wayne Wright, Canadian Petroleum
Producers Association (Ont. Div.),
Toronto, Ontario



Penny Gotzaman, Policy Directorate,
Environment Canada,
Ottawa, Ontario



Doug Harper, Manager
CAP VES Implementation Team, Air
Resources Branch,
Environment Ontario, Toronto



Bill Mills, Proctor & Redfern Consulting
Engineers, Don Mills, Ontario



Alex Manson, Director
Climate Response Strategies,
Environment Canada, Ottawa, Ontario

ONTARIO'S CLEAN AIR PROGRAM-
THE INDUSTRIAL PERSPECTIVE

by
Wayne Wright, Vice-President,
Canadian Petroleum Products Institute,
Toronto, Ontario

The author served as Chairman of a Multi-Sector Task Group which submitted comments to the Minister on the Clean Air Program. The final submission tabled the consensus views of the memberships of eight industry associations representing a significant portion of Ontario's industrial productivity.

The paper focuses exclusively on the policy implications of the proposed program. It deals with the topic on a general level only and does not discuss the many technical and detailed implementation issues which are inherent in the program.

The basic position discussed is one of strong support for the goals and intent of the Clean Air Program but with serious concerns over the inherent complexity, degree of detail and cost.

The author proposes some ideas which are intended to streamline the process. The objective of the policy recommendations is to adhere to the overall program intent and aims while speeding up the delivery of early results and providing more resource effective solutions.

CAP – An Industrial Perspective

Framework for Comments

- Timing
- Focus
- Constituency
- Results

CAP – An Industrial Perspective

A Consensus Approach

"While not all participants would necessarily support all of the comments, it is true to say that each listed participant agrees in principle with the overall direction of the recommendations."

Final Signatories

Canadian Chemical Producers Association
Canadian Petroleum Products Institute
Canadian Portland Cement Association
Canadian Steel Environmental Association
Independent Power Producers' Society of Ontario
Lambton Industrial Society
Ontario Hydro
Ontario Mining Association

CAP – An Industrial Perspective

The Group exhibited two universally held views

- somewhat conflicting
- individual association and corporate submissions

1. Strong support for the goals and intent of CAP.
2. Serious concern over the means suggested.

- Complexity of the process
- Degree of detail involved
- Cost to implement

CAP – An Industrial Perspective

Framework for Streamlining the Process

- Adhere to intent and goals
- Speed up results delivery
- More resource effective solutions
- Identify further needs

- Five Major Recommendations emerged

CAP – The Recommendations

1. Proceed immediately with Source Registration
 - Interim regulation if necessary
 - Appropriate “list” required
-
- Earlier database, thus earlier definition of objective and priorities.

CAP – The Recommendations

2. Separate out Certificates of Approval

- Two part issue
- Layers of complexity

- Uncoupling speeds up both

CAP – The Recommendations

3. Remove Modelling

- Should not be a regulatory tool

- Greatly decreases complexity and timeframe

CAP – An Industrial Perspective

4. Monitoring should be at Guidelines level only

- universal monitoring requirements
very contentious.
- Data acquisition/analysis extremely
resource intensive.
- Much quicker implementation and re-position monitoring

CAP – The Recommendations

5. Consider both Toxicity and Exposure
 - Priority setting
 - Technology choice
 - Background to Phase I chemicals
- Increased effectiveness and efficiency of CAP

CAP – Summary

Support for program, concern on over-complexity of implementation.

– Streamline

Policy Recommendations

1. Immediate source registration
2. Separate Certificates of Approval
3. Remove modelling
4. Guidelines for monitoring only
5. Balance toxicity and exposure

ONTARIO'S CLEAN AIR PROGRAM
SUMMARY OF INDUSTRIAL RESPONSES

by

Douglas S. Harper, Air Resources
Branch, Environment Ontario,
Toronto

INTRODUCTION

Since many of you I expect, are familiar with the Clean Air Program as proposed in August, 1990, it is probably overkill to review the elements at this stage. Rather I would like to deal, as the title suggests with industry's responses. To do this I will use a question and answer format, posing some of the questions you as industry, or government representatives did. As you can expect there was significant divergence in the responses which I will also try to capture.

QUESTIONS AND ANSWERS

WHY DO WE HAVE A SOURCE REGISTRATION AT ALL? ARE WE BEAN COUNTING?

No. It's not an unnecessary bureaucratic exercise. In order to seek reductions of specific toxics emitted by industry we must have a starting point; we must know what's out there and have a reasonable knowledge of how much. It would be pointless for instance, writing regulations to control substances that have or soon will be phased out.

The U.S. working under their SARA Title III legislation have developed an extensive database which they are now using to set regulatory priorities and to identify facilities which must meet the MACT limits. Much of what they are about to do under Title III of the Clean Air Act (1990) depends on this Toxics Release Inventory data.

Industry that responded to the CAP generally recognized the need for inventories, although some were concerned that we might go beyond SARA to a California Hot-Spots-type regulation. The larger companies appeared most comfortable, probably expecting to draw on experience gained by their parent companies responding under SARA.

WHAT ABOUT MOBILE SOURCES? 63% OF THE NO_x AND 46% OF THE VOC's ARE GENERATED IN THE TRANSPORTATION SECTOR

Mobile sources though not included under CAP are receiving significant attention by the Ministry. Under a program we call the VES (Vehicle Emissions Strategy) we will be pressing the Federal Government to adopt 1993 (California) emission limits on 1994 manufactured cars; we will be seeking better vehicle maintenance to ensure emission control equipment is not tampered with and we have already renewed the gasoline volatility requirement of RVP 10.5 for the summer months. We are also looking into other initiatives in concert with other Ministries that would reduce motor vehicle use.

HOW WERE THE EIGHT SO-CALLED "ELLIPSE" SUBSTANCES CHOSEN AS THE FIRST TO BE PHASED-IN UNDER CAP - WHY WERE CERTAIN ONES INCLUDED?

The eight substances are acrylonitrile, benzene, carbon tetrachloride, formaldehyde, vinyl chloride, lead, manganese and dioxins/furans. These were chosen because each was classified as a Level 1 contaminant (contaminants which present a high hazard to the environment, e.g. known or probable carcinogens); and, we have methods in place to monitor these substances.

The choice of at least two of the substances on the list, manganese and formaldehyde has caused concern. We are reviewing the list closely.

DID WE CONSULT ADEQUATELY?

I believe we did. The original discussion paper was on the streets for a long time. We read the comments and considered them seriously. Did we agree with every one? No; and as you can expect, we received comments that were direct opposition to each other.

Nor will that change. I expect for instance that further consultations will be needed with those parties impacted under the NO_x/VOC Management Plan, which overlaps substantially with CAP.

THE CAP MODELS ARE TOO STRINGENT?

The models are stringent but we have heard little to date that suggest they are wrong.

WE SHOULD REGULATE BASED ON EXPOSURE OR RISK NOT SIMPLY THE MERE PRESENCE OF A SUBSTANCE IN A FACILITIES EMISSIONS

A number of industries commented in this area. In short why should we reduce emissions of a substance when the risk to neighbours is minute; i.e. for instance where there are no neighbours?

The answer is partly technical; partly moral.

The moral part is straightforward: there is no right in law to emit contaminants.

Beyond that, the technical reason is based on our growing knowledge of long-range transport of pollutants. Just because a pollutant causes no measurable deleterious effect near the point of emission that does not mean there are no effects, period. This is what the entire NOx/VOC's issue is all about. Every contribution of either contaminant group contributes to the larger problem in some way.

WHERE ARE WE GOING NOW?

At the direction of the Minister we are reviewing CAP right down to its philosophical foundations. The review is focusing on inclusion in the program, greater emphasis in two closely related areas:

pollution prevention, and

multi-media concerns

Solutions to the pollution that simply create another form of waste for disposal, whether it be the contents of baghouses or the effluent from scrubbers are not the sort of solution that will be part of the new conserver society.

They simply change the problem.

I am not pretending that such concepts are new. We have used prevention-type concepts frequently in the past. What we have not done as a regulatory agency is encourage prevention over capture. We are looking for ways in which that direction can be given. We expect you are already looking too because these options could offer real cost savings as the costs of waste disposal rise, and as the costs of purchasing new control equipment rises too. Those of you who have explored Selective Catalytic Reduction as a means to reduce your NOx emissions will relate to this.

AIR EMISSION CONTROL DURING DECOMMISSIONING

by

W.J. Mills, Senior Environmental Chemist, Wsate
Management Group, Proctor & Redfern Limited,
Consulting Engineers, Don Mills, Ontario

THE SMITHVILLE, ONTARIO PCB INCINERATION PROJECT:

From 1978 to 1985, a PCB waste transfer and storage facility was operated by Chemical Waste Management Ltd. (CWML), in Smithville, Ontario, Canada. For various reasons the company ceased operations in 1985. The Ontario Ministry of the Environment (MOE), assumed responsibility of the site in the Fall, 1985 after high level of uncontained PCB's were detected on the orphan site. In January 1986, Proctor and Redfern Ltd., were selected by the MOE to provide project management and technical consulting services for the site cleanup and development of long term remediation strategies. During 1986 and 1987, an extensive site cleanup was undertaken to consolidate and place into secure storage, the large quantities of PCB contaminated equipment, solids and, liquids present on site (1). This then became Ontario's largest PCB storage site. In late 1988, MOE selected ENSCO Inc. to perform the destruction of the 160,000 litres of liquid, 4000 cubic metres of contaminated soil and, 2000 tonnes of miscellaneous material on site. The ENSCO technology being used is the MWP-2000, transportable Rotary Kiln incinerator.

After an extensive review process, which included public hearings, ENSCO was granted the required certificates of approval in the summer of 1990. Mobilization of equipment to the site began in October 1990. The incineration of PCB's began in February 1991. This project, which is the first of its kind in Ontario and only the second in Canada (2) is scheduled to be completed mid August 1991.

An extensive environmental monitoring program was developed and implemented to determine the effect (if any) of the incineration on the environment. This program includes soil, water and, ambient air testing before, during and, after incineration. The liquid and solid effluents from the incineration are monitored to ensure that effluents are meeting regulatory limits prior to being discharged. Stack testing has shown that the incinerator is achieving 99.9999% DRE and meets the other regulatory limits.

- (1). The Smithville PCB Site Cleanup: Superfund '89, Washington, D.C., Nov., 1989.
- (2). The Goose Bay PCB Incineration Project: Superfund '90, Washington, D.C., Dec., 1990.

ENSCO INCINERATOR

- Two types of burn:
 - 1) soil
 - 2) liquid/metals
- Solids, liquid organic wastes, (during stack testing only) sludge, waste water fed into Rotary Kiln
- Liquid wastes and waste water injected into secondary chamber.
- Total PCB loading will not exceed 410 kg/hr.
- Demonstrated DRE: 99.9999%.

ESTIMATED QUANTITIES OF MATERIALS

<u>Type</u>	<u>Amount</u>	<u>PCB Content</u>
Liquids (oils & aqueous)	270,000 litres	0-60%
Solids	160,000 kg	0-40%
Soil	4,000 m ³	0-20%

MONITORING OF OPERATIONS

- Regulatory Inspectors on-site 24 hrs./day during PCB incineration
- Continuous process monitoring with computer data storage (Data Acquisition System)
- Environmental monitoring data

ANALYTICAL PARAMETERS

Solids PCB, PCDD/DF, Metals

Liquids PCB, PCDD/DF, Sewer Use By-law

Ambient Air PCB/CB, PCDD/DF, VOC, Metals

Stack Test PCB (DRE), CB, CP, PCDD/DF, PAH, VOC, HCl, TP, Metals

Surface PCB

ENVIRONMENTAL MONITORING SCHEDULE

<u>Stack Tests</u>	2 x ENSCO 1 x P&R (for MOE)
<u>Ambient Air</u>	PCB/CB daily PCDD/DF, VOC, Metals weekly TAGA 3 x
<u>Water</u>	Pre & Post (Background Levels) Prior to discharge
<u>Ambient Soil Sampling</u>	Pre & Post After incineration
<u>Incinerated soil:</u>	as produced
<u>Surfaces</u>	After incineration and decontamination
<u>Stack gases</u>	continuous emission monitoring for PCB incinerator CO,CO ₂ ,O ₂

CONTROL OF TOXIC EMISSIONS DURING INCINERATOR OPERATIONS

See: Eklund, B. and Summerhaus, J.

"Procedures for Evaluating Emissions From the Cleanup
of Superfund Sites"

J.A.W.M.A. - January 1990, p 17-23

Incinerator

Hydrocarbons, PCB, PCDD/DF	-	Primarily
Particulates	-	Air emissions
Acid Gases		
Fugitive Emissions		

Soil (Feed)

Excavation and transportation, (FEED PREP)

Hydrocarbons

Chlorinated organics (chlorobenzenes, TCE, etc.)

Particulates

SOIL HANDLING

Excavation:

- | | | |
|-----------------------|---|---------------------------------|
| Particulates | - | Water sprays (dust suppression) |
| Hydrocarbons/Solvents | - | Wind screens |
| | - | Screening |
| | - | Geotextile covering |

Waste Staging/Feed Preparation

- | | | |
|-----------------------|---|---|
| Particulates | - | Normally store 3 days max. in staging area |
| Hydrocarbons/Solvents | - | Covered areas with carbon scrubbing for handling liquids, drummed waste, etc. |
| | - | Hydraulic shear to be enclosed |

Ash Handling

- | | | |
|--------------|---|--------------------------------------|
| Particulates | - | Quenched with water
store in bins |
|--------------|---|--------------------------------------|

CONTROL OF TOXIC EMISSIONS DURING INCINERATOR OPERATIONS

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Incinerator

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Particulates	-	Air emissions
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Excavation and transportation, (FEED PREP)

Hydrocarbons

Chlorinated organics (chlorobenzenes, TCE, etc.)

Particulates

PROJECT CLEANUP CRITERIA

<u>Solids</u>	PCB	<0.5 ppm (total) mg/kg
	PCDD/DF	1 ppm (total) mg/kg
<u>Liquids</u>	PCB	1 PPB (total) ng/L
	PCDD/DF	<0.25 ng/L per congener
	Various Metals	Sewer Use By-Law
<u>Surface</u>	PCB	1,000 ug/m ²
		10 ug/100 cm ²
<u>Stack Test</u>	PCB DRE	99.9999% (1 mg/kg)
	PCDD/DF	12 ng/m ³ TEF (Federal Guideline)
	Particulates	50 mg/m ³ max, 40 average
	HCl	50 mg/m ³
	Combustion Efficiency	99.9%
	all concentration corrected to	11% O ₂ and 25°C
<u>Ambient Air</u> (POI & measured)	PCB	450 ng/m ³ (1/2 hr)
		150 ng/m ³ (24 hour)

OTHER

- Drum and Equipment Decontamination** - Enclosed area
 - Wash pad for all equipment leaving
- Water Discharges** - Water treatment systems tested before discharge
- Noise Control** - Modification of equipment and "muffler"
 - Restriction on operating Schedule

PHASE III (INCINERATION) STATUS

- First application of Ontario Regulation 148/86 to a Class 1 technology and site.
- Second commercial mobile PCB Incineration project in Canada.
- Public Hearing held March - April, 1990.
- Board prepared their decision including Certificate of Approval, May 1990.
- Certificates of Approval for site, system and air include project criteria and environmental monitoring requirements.
- ENSCO mobilized to site on Oct. 1990.
- Incineration of PCB's - Feb. 7, 1991.
- Compliance Stack Tests Series I & II - February, 1991.
- Incineration Scheduled to finish at end of August.

EPA CLEAN AIR ACT -
EFFECT FOR ONTARIO

by

Alex Manson, Director, Climate
Response Strategies, Environment
Canada, Ottawa, Ontario

At the time of assembly of the Proceedings for printing, a text of the author's paper had not been submitted for inclusion in the numerical sequence.

If the paper was subsequently received, it is incorporated in these Proceedings following the listing of the Conference delegates.

Otherwise, those wishing further details on this subject are asked to contact the author direct.

EMISSIONS CREDIT TRADING

by
Penny Gotzaman, Policy Directorate,
Environment Canada, Ottawa

I am very pleased to be here today to talk to you about emissions trading. It is an issue which is getting increasingly more attention by policy makers in both the federal and provincial governments.

Emissions trading is an untried approach in Canada. It has, however, been used to manage several air quality problems in the United States, and a trading program for sulphur dioxide emissions was recently introduced as part of the U.S. program to control acid rain. We can learn a lot from the U.S. experience about the "do's and don'ts" of implementing emissions trading programs to address our environmental problems in Canada.

There are significant potential advantages to using emissions trading to achieve our environmental objectives. For that reason, public discussion and debate on the issue -- such as the opportunity offered by this conference -- and further practical research is very important and should be encouraged.

What I would like to do today is outline for you the federal government's approach to market-based instruments in general, and emissions trading in particular. Then I will turn to how emissions trading programs would actually work, touching on some of the key design and implementation issues that would need to be addressed in setting up any emissions trading program. Then I will briefly address a specific potential application.

Market-based Instruments

A key underlying message in the federal government's environmental policy -- the *Green Plan* -- is that good environmental policy is good economic policy. We can achieve both high levels of environmental quality and economic growth. But in order to do so, the environment and economic considerations must be integrated into the decisions made by all of us -- governments, businesses and individuals.

Environmental science, education and information are all important for integrating environmental considerations into decision-making. But they are not enough. More direct measures -- namely regulations and market-based instruments -- are also necessary.

As you know, traditionally in Canada we have in large measure relied on regulations to achieve our environmental objectives. The federal government recognizes in the *Green Plan* that regulations continue to have a very important role.

But it is also recognized in the *Green Plan* that the use of appropriately designed and applied market instruments have significant advantages over the traditional regulatory approach. And that is not to say that market-based instruments are the most suitable in all cases. Much depends on the nature and source of the environmental problem, and on administrative considerations. In some cases, traditional regulations can be the most appropriate or cost-effective approach. In others, market instruments can achieve the same environmental goal in a more cost-effective manner, and are therefore an appropriate substitute. In yet other cases, features of market instruments and regulations can be used together to most effectively and efficiently achieve environmental goals -- emissions trading fits into this category.

The *Green Plan* therefore establishes as Canada's goal the balanced use of strong and effective environmental laws with market-based approaches.

Market-based instruments work through the market to give producers and consumers the financial incentive to, as a matter of course, integrate the environment into their decisions. Some economic instruments, for example environmental charges

and tax incentives, directly affect the prices facing producers or consumers, and therefore influence their production and purchasing decisions. Other instruments, for example emissions trading, create a market and price for access to environmental resources -- this has a direct or indirect effect on consumer and producer prices.

One of the most important advantages of market-based instruments over regulations is that they permit businesses as much flexibility as possible in the measures they can employ to meet the specific goals and targets established by governments. This allows them to use their creativity to find innovative and cost-effective solutions. Regulations, on the other hand, provide little incentive to go beyond regulatory requirements.

A second key advantage of market instruments is that they provide a continual financial incentive for firms to cut back pollution, and therefore a continuing incentive for them to develop and implement new technology and processes to control pollution.

By virtue of these two advantages, market instruments can help us achieve high levels of environmental quality, while at the same time creating business opportunities and enabling us to achieve our environmental objectives more cost effectively. They allow governments and industry to concentrate on what they do best. Governments

set targets, based on science, and establish an economic framework. The private sector is left to meet those targets in the most innovative and efficient way.

In recognition of these advantages of market instruments, and our inexperience with their use in Canada, in the *Green Plan* the federal government undertook to prepare a discussion paper on economic instruments. The discussion paper, which will be released shortly, explores a number of possible applications of a number of market instruments, including emissions trading. The release of the paper will be followed by an extensive consultations process. The consultations will provide fora where the practical issues surrounding the range of applications of various market instruments can be thoroughly debated and aired.

In the *Green Plan*, the federal government also committed to, in cooperation with the provinces, pursue emissions trading to control ground-level ozone. The federal and provincial governments, in consultation with stakeholders, will determine the extent to which emission trading can be used in the urban centres most affected by smog. This examination is currently underway under the auspices of the Canadian Council of Ministers of the Environment -- specifically the governments are examining the possibility of using emissions trading to reduce emissions of nitrogen oxides and volatile organic compounds in the Lower Fraser Valley.

In the *Green Plan* the federal government also undertook to determine with the provinces the feasibility of using emissions trading as a means of controlling sulphur dioxide emissions in both eastern and western Canada. This examination, too, has commenced under the auspices of the Canadian Council of Ministers of the Environment.

Emissions Trading

How would emissions trading work? The concept is straightforward. The application is more complicated -- the degree of complexity varies with the potential applications.

Emissions Trading -- The Concept

Emissions trading combines features of the traditional regulatory approach and market incentives, drawing on the strengths of each approach.

Under an emissions trading program, the appropriate regulatory authority would establish a ceiling or limit on total allowable emissions of a pollutant. It would then allocate the total allowable emissions among the sources of the pollutant through permits authorizing the sources to emit a certain amount of the pollutant.

The permit holders would then be allowed to buy or sell permits. Those firms which can find ways to reduce their emissions below the level authorized by their permits at a lower cost than others, would have the incentive to do so, and could sell their "extra" permits to another source whose pollution abatement costs are higher. On the other side of the coin, those firms that have high abatement costs would have the incentive to buy additional permits from other companies, if the purchase price were less than their cost of abatement.

The bottom line of this flexibility offered by emissions trading is that the sources of pollution with the lowest abatement costs would cut back on pollution by more than the higher cost sources. The target level of emissions would therefore be achieved at a total lower cost to the economy than regulatory standards which would, for example, require all pollution sources within a given category to meet the same pollution standard regardless of the differences in abatement costs.

Emissions trading also has the added advantages of offering a good deal of assurance about the resulting level of pollution, and of being able to accommodate growth in an industry without jeopardizing environmental quality. Moreover, they can address a number of related environmental objectives simultaneously -- this is very important in light of legitimate concerns expressed by industry that it is important that governments integrate their various initiatives to deal with interrelated environmental problems. I will expand on these advantages briefly.

Clearly, it is essential that any measure undertaken by governments to address an environmental problem be carefully designed to achieve the environmental objective. Emissions trading offers the advantage of being able to achieve the objective with considerable certainty, in particular for the sources of pollution included in the emissions trading program, because a cap is placed on the emissions from these sources. Regulatory standards may, for example, stipulate what equipment sources of pollution may use. But it is difficult to control the total actual emissions -- much depends on a number of factors, for example, production levels, and maintenance and operation of the equipment.

Emissions trading can more easily accommodate entry and growth in an industry without a resulting increase in emissions, because a firm can expand or enter an industry provided it acquires the necessary emission permits. Under a regulatory system, on the other hand, there is more likely a trade-off between targeted emissions and growth. A regulatory system may therefore have the effect of preventing growth or entry in order to maintain environmental quality. Indeed, it was to allow growth and entry that certain trading components were added to the air pollution control program in the United States.

Emissions trading can more easily address multiple environmental objectives than regulations. This could be particularly useful in the case of atmospheric emissions, where a single activity can give rise to a number of different types of

emissions. The burning of coal by an electric utility, for example, can produce SO₂ emissions which lead to acid rain, NO_x emissions which lead to acid rain and urban smog, and CO₂ emissions which contribute to global warming.

A regulatory approach to limiting these emissions could involve the regulator making difficult choices between different types of equipment that would produce different combinations of emissions.

Under an emissions trading program, on the other hand, not the regulator, but the company involved, which is in the best position to do so, would make a judgment as to the least cost combination of emission reduction options. These options could include, for example, demand side management initiatives to limit electricity demand, investments to improve combustion efficiency, investments in pollution abatement equipment, and the purchase of emission permits from another source. Regulators would set overall ceilings for emissions of each of the pollutants, and allocate permits for each pollutant to the targeted sources. The targeted companies would then employ their own expertise to find the least cost way of staying within the various limits.

Emissions Trading in Practice

You may be questioning that this is well and good, but theory is one thing, and practice is another. And this is a legitimate question. But tradeable permit schemes have worked in practice in the U.S. -- in some cases better than others, but in all cases emissions trading resulted in significant cost savings. And certainly in view of the U.S. experience, and the potential advantages of tradeable permit schemes, it is important to carefully examine their possible application in Canada, in particular the design and implementation issues. That is what the federal government's discussion paper that will be released shortly, and the current work being done under the auspices of CCME, is all about.

It is critical to the success of an emissions trading program -- both in meeting its environmental objective and realizing the potential cost savings -- that it be appropriately designed and implemented. There are a number of design and implementation issues that need to be fully explored in relation to specific applications -- for example, definition of the areas in which trading of permits would be allowed; seasonal and episodic controls; the sources of pollution that would be included in the trading program; the total emissions limit for the sources included in the trading program; the initial allocation of permits among the included sources; effective monitoring and enforcement; potential barriers to trading permits; "banking" permits for future use; and cross-pollutant trading.

Some of these design and implementation issues -- the definition of the trading zone(s), the sources to be included in the program, the emissions limit set for those sources, whether to permit "banking" of permits, and effective monitoring and enforcement -- are issues which are important to ensuring that the trading program will meet the environmental objective.

The other issues in large measure define the "rules of the game" for buying and selling permits. For the potential cost savings of using emissions trading to be fully realized, the permits must be bought and sold actively. While permits would most likely trade relatively freely between sources of pollution in a given firm, it would not always be the case between firms. In order for permits to trade between firms, the firms must not behave strategically in the permit market -- that is, they must not seek to gain a competitive advantage by, for example, withholding permits from competitors. Generally, the greater the number of sources targeted by a permit program, the greater the likelihood that firms will actively buy and sell permits.

In addition, the "rules of the game" must seek a balance between avoiding making the trading process so cumbersome as to inhibit firms from buying and selling permits, while allowing for effective monitoring and enforcement to ensure the integrity of the system.

I will outline in a little more detail a few of the design and implementation issues I listed in order to give you an appreciation of some of the considerations.

From the perspective of environmental protection, trading zones, which are the geographical areas within which sources of a given pollutant would be allowed to buy and sell permits, ideally would encompass an area throughout which emissions could be traded without exacerbating the environmental problem in any one part of the area. There would also ideally be a sufficient number of sources of emissions in each trading area to create an active market in the buying and selling of permits. The number of sources is therefore an important consideration that must be weighed in defining trading zones. I should note, however, that while there may not be enough sources to ensure that permits are traded perfectly freely, some cost savings would be realized as long as some trading takes place. Trading between zones could, under some circumstances and under defined terms, be considered.

Also from both an environmental and economic standpoint, ideally all the sources of the pollutants subject to the program should be included in a given trading program. Frequently, however, it would be administratively costly and impractical to include numerous small sources. This raises questions of equity that would need to be addressed, particularly if the distributional impacts are significant.

How to distribute the permits at the start of the program is another important issue. Permits could be allocated to existing emission sources based on emissions in some historical period. Alternatively, they could be distributed by auction.

The main difference between the two allocation options is their distributional impact. Given the supply of permits is fixed, they become valuable. If the permits are initially allocated on a historical basis, therefore, the firms allocated the permits may profit substantially from the sale of permits. Moreover, those firms that both were the biggest polluters in the past and have relatively low abatement costs (and therefore would be sellers of permits) would stand to be the biggest winners. Under an auction scheme, on the other hand, the government would essentially capture the economic gains that would otherwise be captured by the firms. Moreover, firms would bear more of a financial burden under an action scheme -- this could have an impact on their international competitiveness. Another difference between the two options is that allocation by auction creates more uncertainty for the sources of pollution.

It is important that trading rules be clear and not create high transactions costs that would discourage willing buyers and sellers from trading. At the same time, the trading rules must allow for monitoring of both emissions and trades to ensure the integrity of the system. Requiring prior approval of trades is one option. Alternatively the program could be monitored through a process for reporting both trades and

emissions, supplemented with random spot checks of emissions, and an effective system of penalties.

Potential Applications

There are a number of possible applications of emissions trading. Emissions trading could, for example, address the problem of acid rain by managing the target caps on eastern Canadian and national emissions of sulphur dioxide. Trading programs for emissions of nitrogen oxides and volatile organic compounds could assist in meeting target levels for ground-level ozone concentrations established by the federal and provincial governments. And a program applied to carbon dioxide emissions or to carbon in fuels could assist in meeting our global warming commitment to stabilize carbon dioxide emissions.

Potential Application to Acid Rain

In the case of acid rain, for example, under Canada's Acid Rain Control Program, the federal government and the seven provinces east of Saskatchewan agreed to reduce total eastern Canadian emissions of sulphur dioxide to 2.3 million tonnes per year by 1994. They also agreed to a series of limits to provincial emissions to achieve this objective. Canada has committed to extend the cap on SO₂ emissions

by the seven easternmost provinces from 1994 to the year 2000, and to establish a permanent national emission cap of 3.2 million tonnes of SO₂ by the year 2000.

Emissions trading is well suited to controlling SO₂ emissions, since an overall emissions cap has already been established. Indeed, the existing control program has some of the characteristics of a tradeable permits system. Ontario Hydro, for example, is free to "trade" emissions between its various electricity generating stations, provided its total emissions do not exceed the authorized level. A formal permit trading program would continue to allow emissions "trading" within a given company. But it would also allow trading between companies, which would increase the potential cost savings.

Several trading zones would be appropriate from an environmental point of view, since there is considerable variance in the gravity of the acid rain problem across the country. Three zones might be appropriate, comprised respectively of the Atlantic provinces, Ontario and Quebec, and the western provinces (including Manitoba). Zones defined in this way may not unduly distort the environmental effectiveness of the system, and they would be convenient for administrative purposes.

A potential difficulty with a trading program is that a large proportion of SO₂ emissions are generated from a small number of companies -- six corporations

included in the Acid Rain Control Program for eastern Canada account for approximately half of all Canadian emissions of SO₂. While a national program would also include major western sources, and consideration could be given to including some smaller sources, there could still be a problem of a relatively small number of firms in each trading zone.

This could be at least partially addressed by allowing some trading between zones on the basis of a defined trading relationship. Allowing inter-pollutant trading between SO₂ and nitrogen oxides -- which also contribute to acid rain -- could potentially expand the market for permits, as could allowing trading between Canadian and American sources.

Conclusions

In conclusion, there are significant potential advantages of using emissions trading to manage air pollution problems. There is more work to be done in sorting through the practical design and implementation issues for specific applications. In recognition of both these points, their possible application is being examined both within the federal government and the Canadian Council of Ministers of the Environment. Consultations with all stakeholders will also be an important aspect of assessing the potential for their use in Canada.



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EVALUATION AND OPTIMIZATION
TECHNIQUES FOR EXISTING WASTEWATER
TREATMENT PLANTS

by
Daniel Nolasco and Joe P. Stephenson,
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Ontario

ABSTRACT

This paper describes several techniques used to assess the condition of existing municipal wastewater treatment plants, to identify their hydraulic and process bottlenecks, and to establish the plants' actual capacity. Hydraulic modelling, oxygen transfer tests, online data acquisition, digester tracer studies, and dye tests are among some of the tools used for evaluation and optimization. These tools assist in the generation of accurate design information for plant expansions, combining process operating and design information not readily available from traditional evaluation approaches. Used in conjunction with traditional plant operating information, the results are used to determine a plant's ability to treat future loads while forestalling plant expansion when possible. If the results indicate that a plant expansion is needed, the information gathered will be useful for design. Using these techniques, the potential for energy savings in the aeration system and the advantages of installing online instrumentation for process control became evident in several plants.

Future trends in evaluation, design, and control of wastewater treatment plants are also addressed in this paper: dynamic modelling, expert systems, and additional online data acquisition instrumentation.

1. INTRODUCTION

There are well documented studies that indicate process failures in wastewater treatment plants. Studies conducted by the U.S. Environmental Protection Agency (EPA) indicate that one third to one half of these facilities do not meet the standards for which they were built. Van Fleet (1981) and Hegg et al. (1979) found that around 50 to 90 percent of the plants investigated regularly violate treatment standards. Berthouex et al. (1985) selected 15 plants that were operating well within their permitted limits to characterize plant upsets. The most common causes of suspended solids (SS) and biochemical oxygen demand (BOD) excursions were low dissolved oxygen (DO) concentrations in the aeration tanks, low mixed liquor suspended solids (MLSS) concentrations, high influent wastewater flowrates, and solids handling problems.

Rapid industrialization and urbanization in Ontario have focused the public's attention on acceptable effluent quality. The activated sludge process is a cost intensive process that has been generally designed and constructed using traditional design guidelines based on steady state assumptions. This practice does not always permit optimum operation and expenditure minimization. Limited conventional process data are collected at the plant on a discrete basis (grab-samples). Such discrete information is often not sufficient to determine the dynamic operating characteristics and ultimate treatment capacities of these

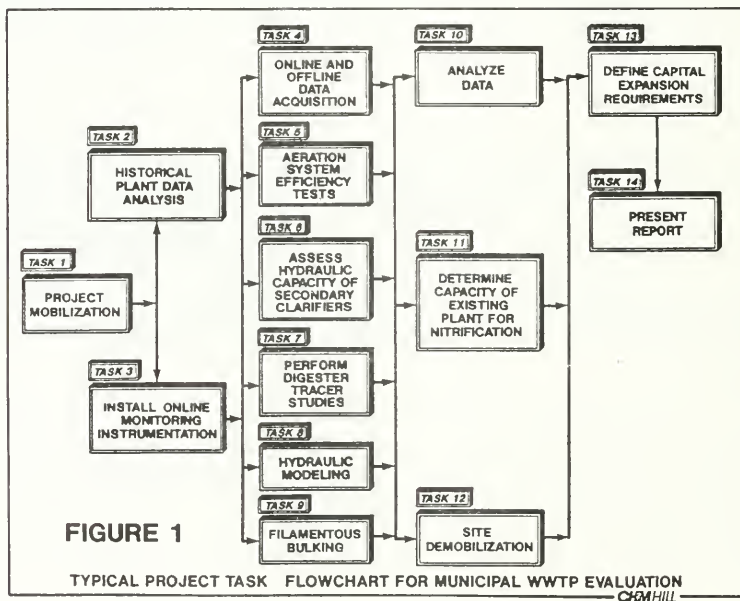
facilities. In some cases, the limited information reduces process control options, leading to plant upsets and excursions from the effluent limits.

CH2M HILL employs several evaluation and optimization techniques to assess the actual condition, capacity and operating status of a wastewater treatment plant. These techniques are grouped under the title "Wastewater Treatment Process Audit", also called the "Plant Analysis Technologies (PAT)" program. In many cases, the application of recommendations resulting from the audit leads to significant energy savings and postpones or minimizes plant expansion requirements through more effective process optimization and control.

2. PROGRAM COMPONENTS

The individual components of the Plant Analysis Technologies Program are:

- Historical data analysis
- Online data acquisition
- Offline data acquisition
- Oxygen transfer tests
- Stress tests
- Clarifier dye tests
- Hydraulic modelling
- Digester tracer studies
- Microscopic identification of filamentous organisms



All of these "tools" are not necessarily employed to assess a specific treatment process. Selection of the tools of analysis to be applied at a specific plant depends on the characteristics of the treatment facility, the problems of concern, time constraints, and budget. A typical project flowchart of tasks for a municipal wastewater treatment plant evaluation is shown in Figure 1. A list of plant evaluations performed by CH2M HILL in Ontario are listed in Table 1 (Daigger et al., 1991).

2.1 Historical Data Analysis:

A comprehensive study of the plant's historical process data provides the initial and necessary information for the process audit. The data analyzed include plantwide flowrates, wastewater and sludge characteristics, influent and effluent characteristics, and unit process performance information.

The time period covered by the historical data review varies subject to specific study objectives and information available. Normally, waste stream characteristics and operating parameters are analyzed for a 1 to 2 year period, while influent flow data are studied for a 10-year period. Flow trends and forecasts are predicted at this stage.

As an example of information resulting from the historical data analysis, a plot of monthly average sludge volume index (SVI) values is shown in Figure 2. The SVI is an indicator of the sludge settling characteristics (the higher the value, the slower the sludge settles). This graph points to possible sludge bulking problems, which would be confirmed by microscopic examination of the sludge. In this case, CH2M HILL recommended sludge chlorination before continuing the audit, to assure an adequate solids inventory during the study.

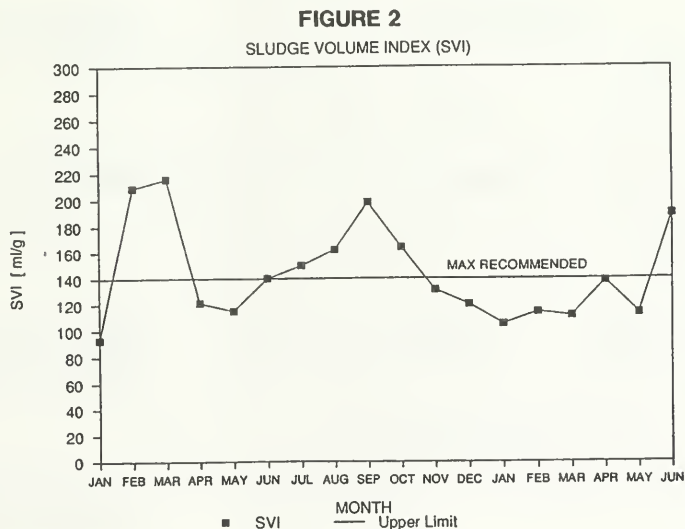


TABLE 1 – CH2M Hill's Plant Evaluations in Ontario

Project and Location	Crosby Dye Testing	Stress Testing	Oxygen Transfer Testing	On-Line Monitoring	Basin Hydraulic Modeling	Digester Dye Testing	Other Tests/Comments
Hespeler WPCP Cambridge, Ontario		AB, C	H2O2				Analyzed pumping control, installed permanent automatic DO and pumping control.
Kitchener WPCP Kitchener, Ontario			H2O2				Energy audit, automatic DO control installed.
Crystal Beach WPCP Crystal Beach, Ontario			H2O2				
Oakville SE WPCP Halton, Ontario			H2O2				Energy audit.
Belleville WPCP Belleville, Ontario			H2O2				Included sludge handling; installed permanent data acquisition system.
Preston WPCP Cambridge, Ontario			H2O2				Off-site pump stations studied.
Galt WPCP Cambridge, Ontario			H2O2				
Lakeview WPCP Mississauga, Ontario			OG, H2O2				DO control testing.
Little River PCP Windsor, Ontario		C, AB	H2O2				Stressed over three seasons, identified filamentous microorganisms.
Corbett Creek WPCP Whitby, Ontario			H2O2				
Duffin Creek WPCP Pickering, Ontario			H2O2				Polymer testing.
Oakville SW WPCP Oakville, Ontario							
Skyway WPCP Burlington, Ontario			H2O2				Biological nutrient removal; on-line phosphorus analysis; identified filamentous microorganisms.
Seaway WPCP Port Colborne, Ontario		C, AB	H2O2				
Waterloo WPCP Waterloo, Ontario		C					Leachate treatability; filamentous microorganisms identified.
Collingwood WPCP Collingwood, Ontario		C	H2O2				Phosphorus removal studies

Legend : C = Clarifier, AB = Aeration Basin, OG = Off-Gas Analysis, H2O2 = Hydrogen Peroxide Method

2.2 Online Data Acquisition

Online data acquisition consists of the measurement of process loading and performance parameters using temporarily or permanently installed instrumentation. CH2M HILL connects online monitoring instrumentation to a microcomputer for data acquisition, analysis and display to assess treatment capacity and operational problems of the facility. The collection of continuous process information in this manner permits detection of dynamic disturbances that cannot be observed with conventional sampling procedures. Online monitoring serves two functions: (a) it facilitates identification of cause and effect relationships not readily observable otherwise; and (b) it permits development of a comprehensive data base for detailed process analysis.

Process variables typically measured through this technique include:

- Process flows:
 - Influent wastewater
 - Return activated sludge (RAS)
 - Waste activated sludge (WAS)
 - Process air
- Process parameters:
 - Mixed liquor suspended solids (MLSS)
 - Return activated sludge suspended solids (RAS)
 - Dissolved oxygen (DO)
 - Effluent suspended solids (ESS)
 - Sludge blanket height (SBH)
 - Process air temperature
 - Process air pressure
 - Aerator power draw

Data are typically collected over a period of several weeks to allow process relationships to be quantified for a variety of loading and operating conditions. Simultaneous collection of real-time process data identifies a variety of process interactions.

Online monitoring has also been applied in several wastewater treatment facilities to assess the potential for electrical energy savings by automatic DO control (Speirs and Stephenson, 1985). Using data recorded over several weeks, the diurnal variation in DO concentration in the aeration tanks of a plant in Ontario was determined (Figure 3). Using the standard aeration efficiency ($SAE = \text{kg of O}_2 \text{ transferred} / \text{kWh}$) determined in separate oxygen transfer tests, the power required to maintain a desirable constant DO concentration in the tanks was determined (Figure 4). The solid line in Figure 4 represents the power required to maintain a DO concentration equal to or greater than 2 mg/L, without automatic DO control, i.e., operating the aeration system at constant speed. The area between both curves represents the potential energy savings with automatic DO control for this particular day. Additional savings by automatic DO control can be achieved under normal daily and seasonal organic loading variations. Such savings can be estimated using offline sampling data and results from oxygen transfer tests.

Once potential energy savings are known, the payback period for purchase and installation of DO control equipment can be calculated. Ontario Hydro has shown great interest in this energy savings approach. Several plants in Ontario have been assessed using this technique.

FIGURE 3
VARIATION IN DO CONCENTRATION AT TWO LOCATIONS

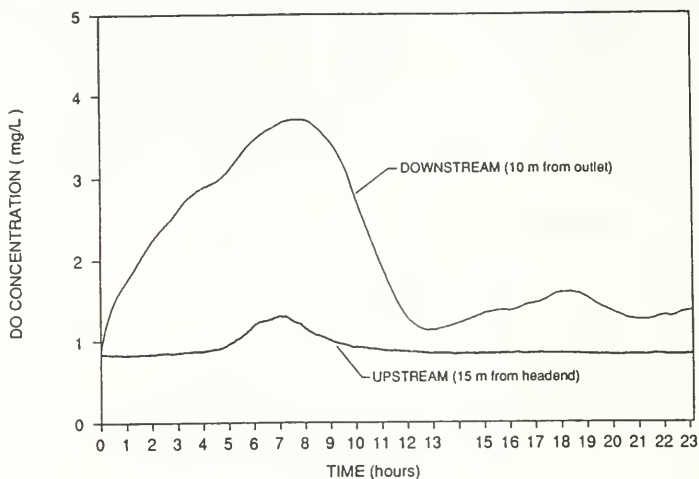
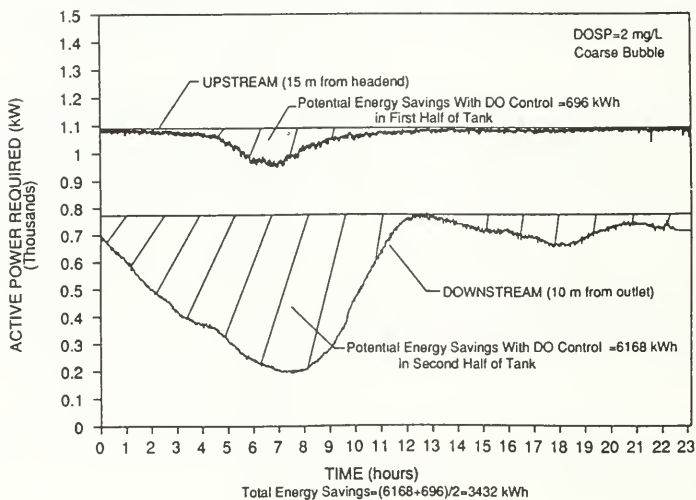


FIGURE 4
ESTIMATE OF ENERGY SAVINGS WITH DO CONTROL



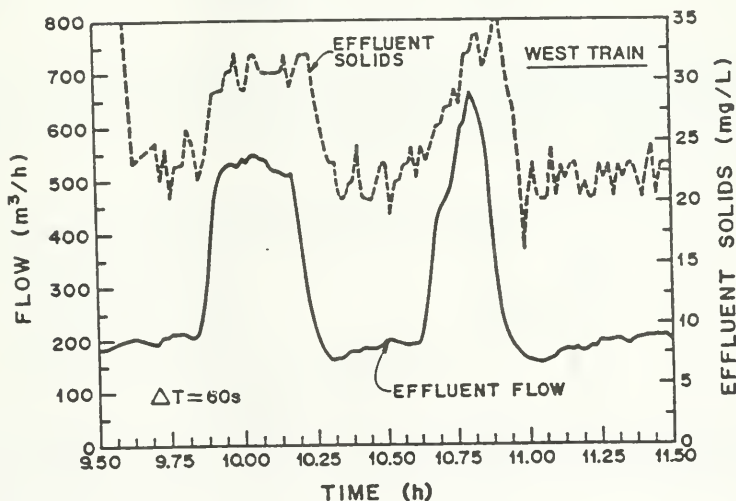
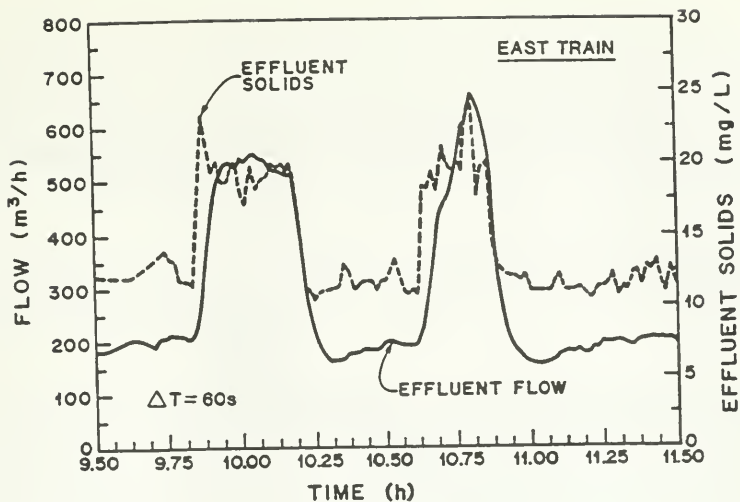


**FIGURE 5 DYNAMIC EFFECT OF HYDRAULIC DISTURBANCES
ON SECONDARY CLARIFIER PERFORMANCE**

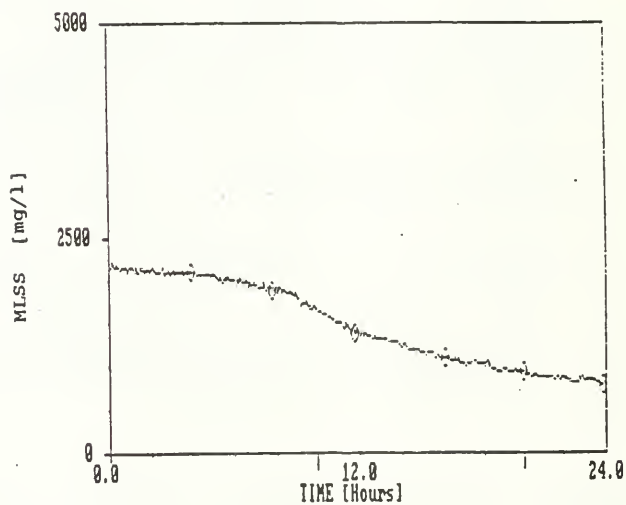
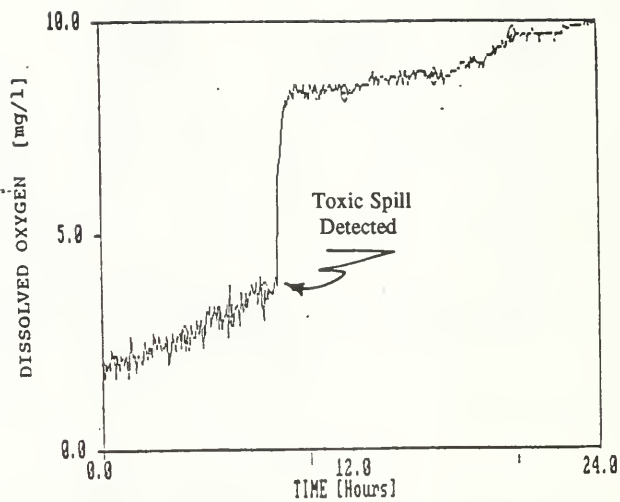


FIGURE 6

ONLINE ILLUSTRATION OF TOXIC SPILL

The impact of hydraulic surges on secondary clarifiers has also been assessed using an online data acquisition system. For example, in one plant, the evaluation of online data showed that hydraulic surges due to cycling of constant speed pumps in an upstream pump station reduced secondary clarifiers performance. The effect of hydraulic disturbances on secondary effluent concentration is shown in Figure 5. These observations were not evident without online monitoring instrumentation. In this case, clarifier efficiencies were improved significantly by retrofitting the pumps with variable speed drives (Stephenson et al., 1987).

The online data acquisition system detected extreme variations in process airflow to the aeration basins in another of the facilities evaluated. These variations corresponded with effluent TSS changes. Modifications to the airflow control system to improve flow splitting and reduce floc shear significantly improved performance (Stephenson et al., 1987).

Process upsets that would be difficult to see quickly using conventional sampling methods have been detected with online instrumentation during these process audits. As an example, a toxic spill was detected in one evaluation project. The upset is illustrated in Figure 6. A sudden increase in aeration tank DO concentration followed by a decrease in mixed liquor suspended solids (MLSS) concentration is characteristic of these type of upsets. The quick response of the online instrumentation, particularly the DO probes, allowed plant staff to sample the raw sewage and determine the most probable source of the toxic dump.

2.3 Offline Data Acquisition:

Off-line process data is usually acquired by analysis of 24-hour composite samples. Some automatic samplers can adjust sample volume to the flowrate to provide flow-proportional composite samples. The samples are usually taken from raw wastewater, primary and secondary effluent. Typical parameters analyzed are:

- Total 5-day biochemical oxygen demand (TBOD5)
- Carbonaceous 5-day biochemical oxygen demand (CBOD5)
- Total suspended solids (TSS)
- Total Phosphorous (TP)
- Filtrable Phosphorous (FP)
- Total Kjeldahl Nitrogen (TKN)
- Ammonia-Nitrogen (NH₄-N)
- Nitrite-Nitrogen + Nitrate-Nitrogen (NO₂ + NO₃-N)

Results from these analyses are used to estimate organic loadings to different unit processes, assess process removal efficiencies, calculate contaminant loadings to the receiving water body, and determine if the plant meets its effluent standards.

2.4 Oxygen Transfer Tests

The determination of the oxygenation capacity of the aeration system is needed to estimate its capability to treat present and future organic loadings and to achieve more stringent effluent requirements, such as ammonia-N limitations. The potential for energy savings in the aeration system can also be assessed based

on the determination of the standard aeration efficiency (SAE) of the system.

The oxygenation capacity (OC) of the aeration system can be determined by either off-gas analysis or hydrogen peroxide methods. The off-gas analysis technique involves measurement of the oxygen content of the gas entering and exiting the aeration tanks using a collection hood. The off-gas analysis procedure can be done during normal treatment process operation. Measurements are made at specific points on the aeration tank surface, allowing quantification of spatial variations in SAE. Given that the cost of a single measurement is low, numerous measurements can be made to allow quantification of both spatial and temporal variations in aeration efficiency. However, the off-gas analysis can only be used with sub-surface aeration systems.

In the hydrogen peroxide test, sufficient hydrogen peroxide is added to the aeration tank to supersaturate the mixed liquor with respect to DO. DO concentrations will then decrease as the aeration system strips excess oxygen from the mixed liquor. The DO depletion data are recorded by the online data acquisition system. An example of the DO curve obtained in a hydrogen peroxide test is shown in Figure 7. The rate at which the DO concentration is reduced in the aeration tank is used to calculate the oxygen mass transfer coefficient ($\alpha FkLa$), from which the oxygenation capacity and the standard aeration efficiency of the system can be determined. A disadvantage of the hydrogen peroxide test is that it is process interruptive (influent and return flows to the aeration tank are shut off for the duration of the test). Nevertheless, this test can be applied to any aeration system; the only specialized equipment employed is the online data acquisition system with appropriate DO probes. A portable DO probe can also be used to record DO concentrations versus time without online equipment.

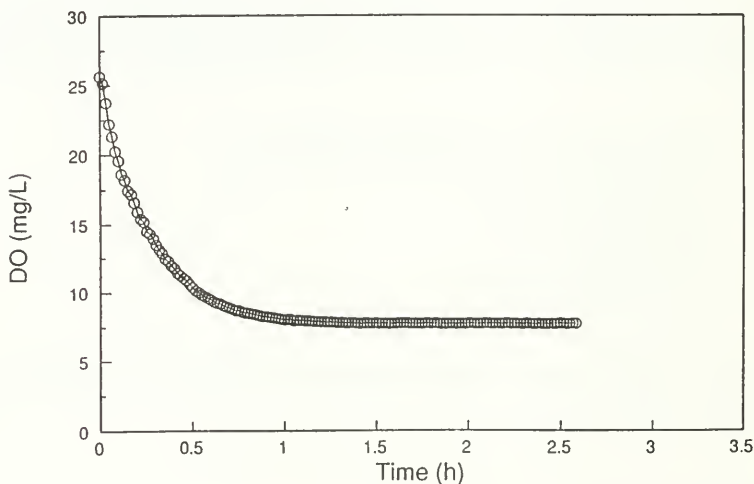


FIGURE 7

TYPICAL DESORPTION CURVE FOR HYDROGEN PEROXIDE OXYGEN TRANSFER TEST

Testing results will not be meaningful if mixing conditions, and therefore DO distribution, in the tank are not uniform. Therefore, prior to performing the oxygen transfer test, an aeration tank DO profile should be performed.

The plant's oxygenation capacity establishes the maximum organic loading that the existing aeration system can handle to meet current or future effluent standards. A typical case is summarized in Table 2. The oxygen requirements were estimated using offline data (influent BOD, NH₃-N), and online data (influent flowrate). Two alternative effluent criteria for BOD and TKN are shown in the table. Average and 95-percentile loadings are indicated for both conditions. The shaded areas in the table indicate loading conditions that cannot be met by the current oxygenation capacity (OC) of the system, as determined in oxygen transfer tests.

Table 2 Example of Estimated Oxygen Requirements (kgO₂/d)				
	Effluent Criteria BOD₅ = 15 mg/L TKN = 6 mg/L		Effluent Criteria BOD₅ = 5 mg/L TKN = 1 mg/L	
	Average	95%ile	Average	95%ile
70,000 m ³ /d BOD ₅ Removal	5,500	13,000	6,000	15,000
BOD ₅ Removal + nitrification	12,000	26,000	14,000	28,000
100,000 m ³ /d BOD ₅ Removal	7,000	17,000	8,000	19,000
BOD ₅ Removal + nitrification	16,000	33,000	18,000	36,000
Maximum oxygenation capacity of the current aeration system operating at water temperature of 20°C and 2 mg/L of residual DO concentration = 13,350 kgO ₂ /d.				

2.5 Stress Tests

Full-scale stress tests are performed in certain process units (e.g., secondary clarifiers), or in complete treatment sections of the plant (e.g., primary clarifiers, aeration tanks and secondary clarifiers). The results from these tests indicate the maximum treatment capacity of the unit process or section stressed.

Hydraulic and organic loading on treatment units is increased by taking other parallel units out of service, thereby increasing flow to the remaining units, or by re-directing flow from other process areas. The effect of stressing the process in this manner is normally measured by grab-samples taken at regular intervals (usually 15 minutes to one hour).

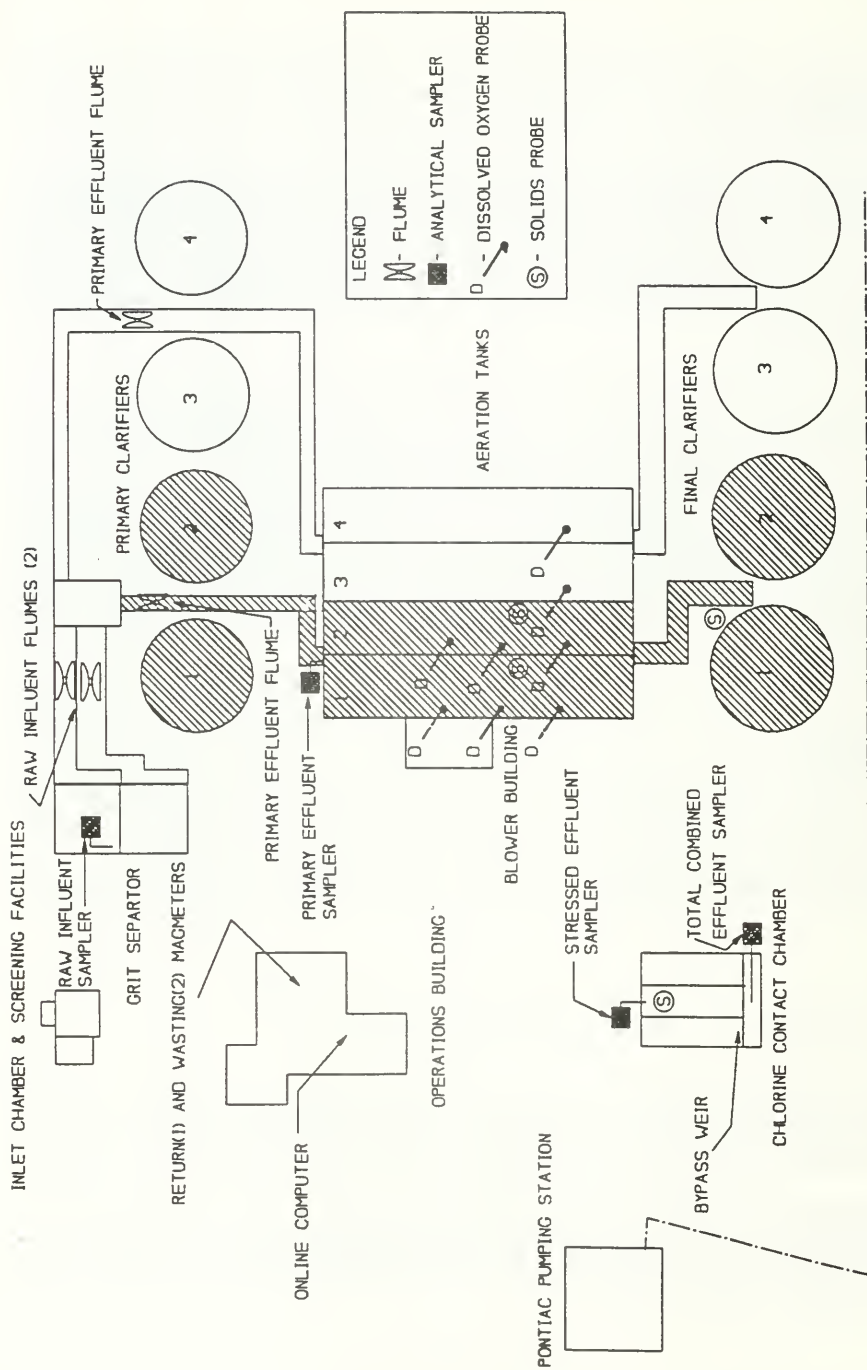


FIGURE 8
SCHEMATIC LAYOUT OF THE LITTLE RIVER POLLUTION CONTROL PLANT

Stress tests performed on the whole secondary treatment system can last a few days to several months. Such tests are often used to determine if more stringent effluent standards could be met at future flows without expanding the plant, or to determine at what flow a plant expansion would be required. Continuous on-line data acquisition is performed during these tests to monitor system response.

At the City of Windsor Little River Pollution Control Plant (LRPCP), an evaluation and optimization study was performed using stress test procedures. The plant average design flow capacity was rated at 36,400 m³/d (8 MIGD). The original Certificate of Approval (C of A) provided compliance limits for BOD₅, TSS and total phosphorous. A new C of A was issued by the Ministry of the Environment calling for more stringent effluent criteria with nitrification requirements. The possibility of down-rating the plant to half of its original design capacity was being considered.

Stress testing was conducted by dividing the plant into two parallel process trains, and stressing half of the plant to determine the loading at which effluent quality was affected. A schematic layout of the plant is shown in Figure 8. The shaded area represents the stressed section of the plant. The flows treated in the stressed section would correspond to a total plant average flow of 46,900 m³/d (10.4 MIGD) and a peak flow of 74,000 m³/d (16.4 MIGD). The plant's single-sample compliance criteria was met over 95 percent of the time. The monthly-sample compliance criteria was met for every month except for one. The stress tests showed that there was no basis for down-rating the capacity of the existing plant.

2.6 Clarifier Dye Tests

Dye tests are used to assess flow distribution patterns in secondary clarifiers and to detect shortcircuiting in these tanks. The procedure was developed by Crosby (Bender and Crosby, 1984) and reveals the fluid progression through a representative cross-section of the clarifier. The results of the Crosby test are a visualization of the tank through-flow route and the solids distribution in the clarifier. The test involves the injection of Rhodamine WT dye in the clarifier influent in two steps: the dispersion test and the flow pattern test. The dispersion test provides sampling time information for the flow pattern test. In the dispersion test, a slug of Rhodamine WT dye is released in the clarifier influent, and the effluent is sampled at several locations over a period of time up to one theoretical hydraulic retention time. The time required for the dye to flow from the injection point to the clarifier overflow is measured.

The flow pattern test reveals the dye distribution in the clarifier at an instant in time. For the flow pattern test, Rhodamine WT dye is added to the clarifier influent at a constant rate. With the first arrival of the dye at the weir, samples are collected at various radial points and depths to obtain a "snapshot" of the flow through the clarifier. By taking a series of measurements over time, the specific flow distribution pattern through the clarifier can be determined. Typically, one set of samples is also analyzed for total suspended solids concentrations to show the distribution of solids within the clarifier.

If the dye distribution in the clarifiers indicates shortcircuiting, the installation of baffles around the tank periphery below the weir is one means to reduce it. Another approach is the installation of a radial ring baffle to interrupt the flow across the tank floor. In other cases, the dye tests may indicate that flow entering the clarifier is affecting performance. In these cases, baffling could be installed near the inlet to reduce jetting effects. Baffling has been proven to be an effective technique for improving the performance of a wide variety of clarifiers.

CH2M HILL's experience in secondary clarifier testing indicates that clarifier analysis is best

accomplished using a combination of stress testing and hydraulic analysis (Daigger et al., 1991). A four step procedure is suggested, as follows:

1. Conduct stress test to quantify capacity
2. If capacity is less than desired, conduct dye tests to identify options for improvement
3. Install improvements
4. Test improvements using stress testing and dye tests

Typical secondary clarifier snapshots are shown in Figures 9 and 10. Ideally, in a circular tank, the dye should progress uniformly from the centre of the clarifier to the periphery. The dye concentration contour for this ideal situation would be parallel vertical lines with reducing concentrations towards the perimeter of the tank. The development of "density currents" indicating short circuiting in a circular clarifier can be observed in Figure 9. CH2M HILL introduced inlet baffles to these secondary clarifiers, reducing the "jetting" effect at the inlet zone. This modification resulted in better dye concentration contour (Figure 10), reducing shortcircuiting and improving effluent quality.

FIGURE 9

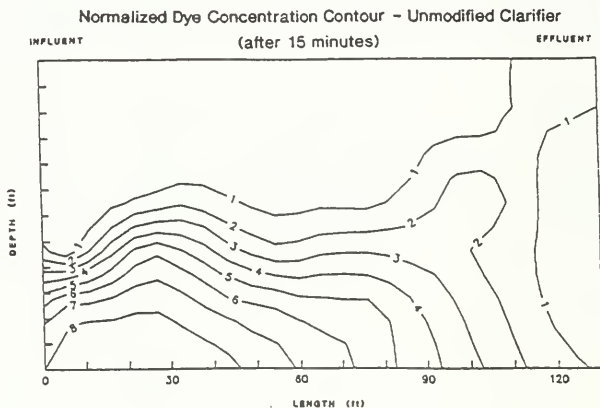
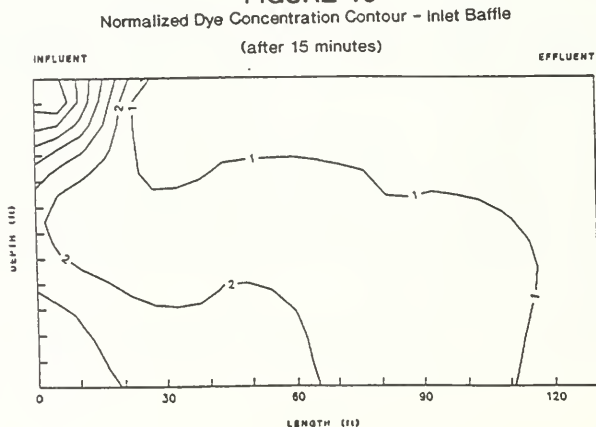


FIGURE 10



2.7 Hydraulic Modelling

Hydraulic modelling is used to assess plant flow imbalances and hydraulic bottlenecks in the plant which can adversely affect treatment capacity. Modelling also provides information on velocity gradients and residence time distribution profiles through the liquid train.

The velocity gradient is an important parameter in the coagulation/flocculation process because it influences both the growth rate of floc particles in turbulent mixing and the rate of floc destruction caused by shear forces in the fluid. The velocity gradient profile is used to select the optimum locations for chemical addition. For best chemical treatment, velocity gradients downstream of the chemical addition point should be high initially for flash mixing, then decreasing for turbulent mixing without floc particle destruction. Also, velocity gradient and residence time are used in laboratory bench tests to optimize chemical dosage.

HYDRO, a computer-based treatment plant hydraulic model developed by CH2M HILL, is used to calculate water surface elevations through a plant at any desired flow rates. The HYDRO program computes the energy grade line (EGL) and hydraulic grade line (HGL) elevations at the upstream and downstream end of each hydraulic element in the plant using well-documented calculation techniques. The analysis begins at the outfall of the plant and proceeds upstream. Subcritical flow is assumed throughout.

The modelling procedure involves three steps:

1. input data specification for each element (initial conditions, flow, component dimensions, hydraulic and friction coefficients)
2. model verification and calibration (input data adjustment to meet known conditions)
3. hydraulic projections at desired flows

The hydraulic component dimensions are generally obtained from "as constructed" drawings, and later confirmed in the field. Field surveys are conducted to verify critical physical elevations and to measure the HGL through the plant at a known flowrate. The survey information is then used to adjust the friction and minor loss coefficients in the model so that the HGL predicted by the model corresponds to actual survey measurements. After calibration, the model is used to predict the plant's hydraulic behaviour at the desired flowrates and to test proposed plant modifications.

HYDRO is a plant audit tool that has been used successfully to locate and either correct or reduce plant flow imbalances.

2.8 Digester Tracer Studies

Digester tracer studies are used to identify reactor dead zones and short circuiting problems.

In this study, an inert tracer, such as lithium chloride, is added to the digester, and its concentration in the digested sludge is measured and recorded with time.

Experience with several tracer studies indicates that the hydraulic performance of digesters are often far from ideal. CH2M HILL has found active volumes in some units as low as half the total digester volume. Opportunities have been identified to increase sludge digestion capacity without constructing new digesters.

The results of primary anaerobic digester tracer studies performed at two wastewater treatment plants in Ontario are summarized in Table 3. The results indicate a considerable reduction in the active volume, and therefore actual hydraulic retention time (HRT) of the tanks. Shortcircuiting was detected in the Duffin Creek WWTP digesters. At this facility, installation of a new mixing system was recommended to resolve the short-circuiting issue.

Table 3 Primary Anaerobic Digester Reactor Tracer Testing						
	Tank Diameter (m)	Total Volume (m ³)	Active Volume (m ³)	Theoretical HRT (d)	Actual HRT (d)	Short-circuiting
Kitchener WWTP						
Tank 5	33.5	7,850	5,057	20.5	13.1	No
Tank 6	33.5	7,850	3,935	20.5	10.3	No
Duffin Creek WWTP						
West Tank	33.5	8,055	5,091	17.1	10.8	Yes
East Tank	33.5	8,055	5,235	16.3	10.6	Yes

2.9 Microscopic Identification of Filamentous Microorganisms

Bulking problems caused by filamentous microorganisms are common in activated sludge plants. The literature indicates that approximately 90 percent of plants in North America suffer filamentous bulking or foaming problems at least once a year. Settling problems caused by filamentous bulking are among the most common process bottlenecks encountered in this type of study.

Certain environmental and process conditions foster the excessive growth of filamentous microorganisms, which leads to settling and foaming problems. These conditions include: very low or high DO concentrations in the aeration tanks; poor mixing in the aeration tanks; low F/M ratios; plant acclimation startup; and toxic loadings to the system.

Several plants investigated had a filamentous bulking or foaming event during the studies described in this paper. In these cases, samples of the mixed liquor, the return sludge, and the foam were microscopically analyzed to identify the type of organism causing the problem. Identification of the filamentous organism(s) involved is an important step in understanding the conditions that fostered its growth. This knowledge, in turn, facilitates establishment of appropriate control measures. Several solutions and process changes can be implemented, but the most common is sludge chlorination. If sludge chlorination is the preferred alternative, a protocol for chlorination control is specified for the plant.

3. TRENDS IN EVALUATION, OPTIMIZATION, DESIGN AND CONTROL OF WASTEWATER TREATMENT PLANTS

3.1 Online Instrumentation

Phosphorous loadings to receiving waters are a common concern for many wastewater treatment plants,

especially in the Great Lakes Basin. The Ministry of the Environment has established stringent effluent phosphorous standards at many of these plants. Therefore, the use of online phosphorous analyzers will be useful in plant evaluations to provide better information on this nutrient.

CH2M HILL has tested the use of online phosphorous analyzers. Several instruments available in the market were investigated. Two of them were shortlisted for a field test. Sample conditioning was found to be a very important factor for the operation of the analyzers. Ultrafiltration equipment was used successfully to reduce the suspended solids concentrations from MLSS and effluent samples prior to entering the instrument. Therefore, the analyzer reads soluble phosphorous. Correct maintenance of the sampling and conditioning equipment, as well as periodic calibration of the analyzers are important tasks to obtain reliable information.

The results from the field tests indicate a potential for adding an instrument of this type to the online instrumentation presently used in plant evaluations. Also, an online P analyzer could be used permanently in a closed loop system for control of chemical addition at the treatment facility.

In addition to phosphorous, other parameters have been measured successfully using online instrumentation (Olsson, 1988), e.g., nitrate (NO_3), ammonium (NH_4), redox and total organic carbon (TOC). The introduction of these or other online instruments to the current evaluation instrumentation will depend on the future requirements of plant evaluation and optimization. The use of online instrumentation will increase in both plant evaluations and in normal plant operations due to ever-strengthening effluent criteria.

3.2 Dynamic Modelling

Dynamic modelling of wastewater treatment processes is another important trend worth noting. It compliments the other evaluation and optimization methods described above.

Hofmann (1988) defines a mathematical model as a consistent set of equations describing certain aspects of the behaviour of a system. In wastewater engineering, models are derived from physicochemical and biological principles based on equations for energy, mass and momentum conservation. Birwistle and Kendall (1988) define simulation (dynamic modelling) as "the art of representing a dynamic system by a model and experimenting with the model to gain insight into the underlying system".

The main advantage of a calibrated simulation program is its ability to predict the time-varying behaviour of a plant without costly and time consuming experimentation.

The equations that describe the dynamic system contain parameters that need to be defined to produce a model that mimics the real treatment process properly. The ability to measure process variables directly with an online data acquisition system is very useful for calibrating a dynamic model. Using these data and the information recorded during the historical data review, the dynamic model can be calibrated under key flow and loading conditions. This calibrated model can be used to reflect plant performance under different conditions.

With a properly calibrated dynamic model, long-term plant performance could be analyzed to anticipate plant expansion requirements. By simulating different expansion/process alternatives, the appropriateness of the many alternatives can be evaluated quickly and inexpensively.

Several process audits are now being addressed by CH2M HILL, in which the data acquisition capabilities of online instrumentation, the hydraulic information provided by HYDRO model, and the dynamic modelling proficiency of the "General Purpose Simulator" program developed by Hydromantis, Inc. (Patry and Takacs, 1990) will be combined in one project. This combination will result in a powerful technical package for evaluating, optimizing, designing, and controlling. The package will also be useful for operator training.

3.3 One Step Further: Knowledge-Based Systems

Although dynamic simulation models are useful in certain aspects of process control, the experience of plant operators and process researchers is needed if a complete control strategy is to be implemented (Nolasco et al., 1989). Most of this expertise is based on qualitative information that cannot be expressed adequately by a mathematical model. Knowledge-based systems (i.e., Expert Systems) are particularly useful to providing and applying such knowledge in an organized fashion.

Expert systems comprise a branch of artificial intelligence (AI). Barr and Feigenbaum (1981) describe artificial intelligence as "the part of computer science concerned with designing systems that exhibit the characteristics we associate with intelligence in human behaviour". An expert system can also be described as "an efficient computer system designed to automatically produce decisions that would normally require the application of both factual and heuristic (rule of thumb) information by a human expert" (Nolasco, 1989).

The integration of a dynamic simulation model with an expert system combines the precision of numerical computing and the qualitative problem-solving and explanation capabilities of knowledge-based systems. Such a system represents an innovative approach for wastewater treatment plant optimization and control.

4. CONCLUSIONS

Several evaluation and optimization techniques used by CH2M HILL to assess the actual condition, capacity and operating status of wastewater treatment plants have been described in this paper. These techniques grouped under the title "Wastewater Treatment Process Audit" have proved to be useful in identifying hydraulic and process bottlenecks, establishing the plants' actual treatment capacity, achieving significant energy savings, and in certain cases, forestalling plant expansion through more effective process optimization and control. Results obtained in these process audits indicate the benefits of applying these technologies, not only in wastewater treatment plants, but also in other waste treatment processes.

Current developments in process control and optimization techniques (e.g., additional online instrumentation, dynamic models and expert systems) are presently being introduced to improve the efficiency and scope of these evaluation and optimization techniques.

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STORMWATER QUALITY BEST MANAGEMENT PRACTICES

by
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Concerns regarding the quality of stormwater runoff and its impacts on aquatic resources have been increasing for many years throughout North America. It is now generally recognized that stormwater must be addressed during the planning, design, and construction of our communities, in a different manner than in the past. In order to achieve development forms which meet our current needs while preserving and maintaining our natural resources for the future, it will be necessary to plan our actions in ways which recognize such things as water quality and quantity, linkages between surface and groundwater, and dependencies between physical and biological resources.

Processes and methodologies for this new type of approach are evolving rapidly in the Province. Terms such as "watershed planning", "ecosystem approach", "sustainable development", "no net loss of habitat", and "enhancement", are encountered in virtually every undertaking. In efforts to turn these guiding principals into actual applications, environmental planners, engineers, and scientists will have to make use of tools including source controls, conservation, land use control, treatment, and structural Best Management Practices (BMPs).

It is this latter class of tools which is the focus of this paper. Structural BMPs refer to ponds, infiltration techniques, vegetative techniques, wetlands, and underground storage facilities, which are implemented as part of a development or as part of a remedial program to correct existing problems. The use of these tools, in conjunction with other options such as housekeeping practices, land use restrictions or limitations, conservation and enhancement programs, and source controls of pollutants will result in future development forms which provide for human needs while protecting the natural environment.

BMP Selection in the Context of Land Use and Environmental Planning

While the emphasis of this paper is on stormwater BMPs which address water quality problems arising from urban development, "water quality" has been defined quite broadly to include not only contaminants, but also baseflow, temperature, and groundwater impacts. It should be recognized that water quality cannot be isolated from water quantity, erosion, and habitat issues. All of these aspects are inter-related (changes in water quantity can effect quality, erosion, and

habitat diversity). Effective BMP design will be based on all water and resource management concerns as opposed to water quality concerns only. In order for this to be achieved, the selection and implementation of BMPs is best conducted within the context of both watershed planning and urban planning frameworks.

A BMP selection process is presented which is intended to represent a top-down approach to water quality. Linkages to watershed planning and urban planning must be recognized. Consideration of BMPs should begin at the highest level (Watershed Plan and Official Plan) and continue through each subsequent planning level. The basis for BMP selection is tied to the potential and the uses desired for the receiving water. The potential and uses desired should be established through the watershed planning and urban planning processes. Once these are known, water quality objectives can be identified based on receiving water characteristics, and a BMP(s) selected to meet these objectives.

No one BMP type is preferred; every BMP has advantages and drawbacks. Therefore, the selection process is designed on the basis of choosing from an arsenal of water quality improvement techniques based on water quality concerns, site conditions, capital and maintenance cost, and design experience with different BMP types. This is different than the approach used by some agencies where a certain BMP technique (eg. infiltration) is preferred, and all other solutions can only be implemented if infiltration is found to be infeasible. The selection process outlined in this paper recognizes that each watershed or sub-watershed may require different actions to address specific use concerns. The process also recognizes that in many instances more than one type of BMP may be required to protect a range of resources.

Recognizing the multi-use nature of water management concerns, it is recommended that continuous analysis be used for the design of water quality BMPs. On a watershed, or large master drainage plan scale, this could involve the use of relatively sophisticated models for surface and groundwater characterization, and biological techniques such as habitat suitability index models. These sophisticated techniques will not always be needed at the local site level, especially where guidance is available from basin-scale Watershed Plans. The term continuous analysis, not continuous simulation, is specifically used in recognition of the possibility of using simpler methods for regional or local water quality analyses. The key intent is to ensure that long term climatological and hydrological (and if possible basin specific) information is used to derive the basis for design, rather than a generic or hypothetical set of conditions.

Impacts of Urban Stormwater Runoff

Urban stormwater runoff has been identified as a significant source of organic matter (BOD and COD), nitrogen, phosphorus, chlorides, heavy metals, suspended solids/silt, oil and grease, bacteria and temperature (Novotny 1985, Qureshi and Dutka 1979, Rippey and Rippey 1986). In addition, a variety of toxic chemicals of domestic and/or industrial origin are often found in urban runoff (Schueler, 1987). Depending upon the stormwater management technologies employed at a particular location, these pollutants can find their way into both surface and/or groundwaters.

Urban development also alters the hydrologic characteristics of a watershed (McCuen and Moglen, 1988; Schueler, 1987). The removal of natural vegetation and grading of the land eliminates both interception and depression storage. The covering of the land surface with pavement and concrete prevents infiltration, and hence, eliminates a third natural storage component (soil storage). Studies have shown that the decrease in infiltration resulting from urbanization has led to the gradual lowering of groundwater levels in some areas (Imhof, 1990; Planck, 1990; Waller, 1978 cited in Free and Mulamoottil, 1983). Reductions in groundwater levels create several problems including reductions in the available groundwater for municipal use, and reductions in groundwater inputs into surface water systems (Imhof, 1990). This latter impact is particularly critical because groundwater inputs are important to the maintenance of base flows in many streams and rivers and because groundwater effects on baseflows have significant thermal effects on streams.

Many different forms of BMP are available to address these concerns. It should be noted that in Ontario, very few facilities of any kind have been designed, constructed, monitored and maintained with water quality concerns in mind. Most Canadian experience is with wet ponds which were designed as aesthetic amenities or as quantity control devices. Experience with other BMP types is available from the U.S., especially in Maryland, but even there, monitoring and maintenance has not been adequate. In addition, differences in climate and development forms between Canada and the U.S. make transfer of experience an uncertain undertaking. Despite this, it is believed that enough is known to require the use of stormwater BMPs to reduce the impacts of urban development. While it is expected that there will be problems and the state-of-the-art will evolve through experience, there really is no alternative. There is ample evidence that urban development, in the form currently practised, is destructive to our water resources.

BMP Types

A variety of BMP types are available to control different urban impacts. Facilities range from centralized devices which collect and treat water from a large drainage area, to "lot" size devices. The emphasis in the following discussion is on the larger centralized facilities, but it should be recognized that relatively passive efforts to maintain the natural hydrological response of the land are important. Discharging roof leaders to lawns and lot drainage to backyard swales can do much to reduce the load on the central systems, both in terms of flow volume and contaminants.

BMPs can be broadly classed into storage types, infiltration BMPs, vegetative techniques and special purpose BMPs, based on the expected performance characteristics and problems of each. Historic experience with quantity control devices and sewage treatment works has led to a heavy emphasis on storage facilities which emphasize sedimentation. While ponds are expected to remain an important type of BMP, increasingly, designers are considering infiltration and vegetative techniques.

Storage BMPs

This broad category includes traditional dry ponds, wet ponds, a hybrid known as an extended detention pond, underground tanks and constructed wetlands. Dry ponds are ineffective as a water quality control, but can be important in local quantity control. Each of the other devices utilize sedimentation to a greater or lesser extent. This is effective for many contaminants, such as heavy metals which bind to sediment. Enhanced nutrient control can be achieved with the wetland and wet pond type of BMPs, due to aquatic vegetation. Tanks and extended detention ponds are not as effective generally, but are useful in "retro-fit" and remedial situations.

Storage devices enjoy traditional acceptance in Ontario, but they have disadvantages that must be recognized. These include thermal impacts and incompatibility with baseflow maintenance. In addition, site specific problems can develop due to algae growth leading to anoxic conditions. Design solutions are available to reduce these disadvantages, but in some instances it is preferable to select a different BMP type.

Infiltration BMPs

This category includes infiltration basins, infiltration and seepage trenches, and porous pavement. Infiltration is an effective method for treating nutrients, metals, and stormwater

temperature. It will result in effective removal of suspended solids, but since this will result in clogging and inactivation of the facility over time, sediment removal is usually accomplished by a supplementary pre-treatment facility. Infiltration BMPs also provide benefits with respect to baseflow augmentation. Drawbacks of infiltration include potential groundwater contamination, high degree of failure (due to unsuitable soils and/or groundwater conditions, lack of maintenance, lack of adequate pre-treatment, and poor construction techniques), high maintenance costs and a comparatively short life span.

Infiltration techniques have seen relatively little use in Ontario, with widespread use occurring only in the Guelph area, until recently. Use of infiltration is often constrained by soil conditions. The advantages of this form of BMP, especially in terms of base flow maintenance and temperature control, are expected to lead to greater use in some locations.

Vegetative BMPs

Vegetative BMPs include buffer strips, grass swales and filter strips. In most cases they are passive measures. It is possible to design systems of these BMPs, especially in combination with infiltration techniques, to receive larger volumes of runoff. Vegetative BMPs act largely through sedimentation and filtering. In general, they are considered to be less effective than either of the previous two categories, and are generally considered to be a supplementary form of BMP, to be used in conjunction with other BMP types.

Vegetative BMPs have the drawback of being relatively ineffective in winter and spring conditions. In addition, while most agencies will encourage their use, few will give any credit for incorporating them into the design. A developer who uses swale drainage will still be expected to provide a storage or infiltration facility of the normal size.

Special Purpose BMPs

This category of BMP includes oil/grit separators, U-V disinfection, and other special purpose designs. Generally these devices are used when there is a specific concern such as vehicle fuelling and storage or a nearby bathing beach. They will usually be a site specific or local BMP. While there is often pressure to include these types of devices as "add-ons" in granting approvals, they are not generally cost-effective for use on a broad scale.

BMP Selection

Each BMP has advantages and disadvantages and the determination of which BMP (or combination of BMPs) is appropriate or "best" in a given situation can only be determined on a case-by-case basis. The perceived disadvantages of any particular BMP in one situation may be irrelevant in another. In most cases, however, it appears that combinations of BMPs probably offer the most creative and effective solutions in terms of meeting flood and pollution control objectives while simultaneously achieving broader "ecological" objectives.

The uses made or desired for the receiving stream or body of water and the resources existing and in need of protection, both locally and downstream, are necessary to provide a context and starting point for BMP selection. Use of BMPs may be required because of basin export concerns, downstream/instream use or local concerns.

There is no blanket hierarchy or priority associated with these different concerns, except as defined by the watershed planning process. Each set of concerns however, will tend to define a set of possible BMPs for consideration. For example, basin export concerns are often dominated by watershed loadings. Accumulation of contaminated sediment at the river mouth, terminal wetland protection, bioaccumulation, and dredging are the major issues. All of these are strongly linked to sediment delivery and will require BMPs which function during the spring runoff period, because this is the time when the majority of sediment is exported. Where basin export concerns are a priority, BMP selection will tend towards the use of ponds, because of the inefficiency of infiltration and vegetative BMPs during the spring period.

Instream/downstream use concerns are usually more dominated by daily ambient conditions and periodic rainfall or spill-driven shock loadings. The uses to be protected usually include fisheries and recreation. The key parameters are typically temperature, baseflow, structural channel integrity, dissolved oxygen, suspended solids (bedload), and bacteria. Nutrients are also of concern, but often as a second order problem. Spills and heavy metals from urban runoff are aspects which must be considered in BMP plan refinement, but they will rarely form a useful basis for BMP selection. Where instream uses are a priority, infiltration techniques and vegetative BMPs will usually be preferred because of temperature and baseflow maintenance concerns.

Local concerns are dominated by site specific conditions and resources. In most cases the concerns are oriented towards protection of existing resources and opportunities to create new resources. Groundwater contamination and preservation or creation of aquatic and terrestrial

habitats are the primary issues. In addition, the impact of the BMPs on the proposed land use is a local issue. In certain cases local concerns may rule out the use of certain BMPs as a primary measure (eg. infiltration in areas of significant aquifer recharge). In most cases however, local concerns can be addressed through design of the selected BMPs.

It should be recognized that the purpose of a BMP is to trap contaminants on-site and that in most cases contaminants are not destroyed. Concerns about accumulation of contaminants in local biota and pond sediment, or bacteria levels in retained surface water, are valid, but should not be an issue in BMP selection. These issues should be decided at the watershed planning level or on the basis of policy and if they are of sufficient concern within the context of the full watershed ecosystem, then BMPs should be limited to vegetative measures and development restrictions.

A combination of BMPs will often be necessary to address different levels of concerns. Because of the range of concerns possible from the local to the basin scale, and the potential for conflict, priorities should be set during the development of watershed plans or master drainage plans in order to guide trade-offs during BMP selection. In many instances regional scale facilities will address some of the concerns (eg. peak flow control) while local BMPs will address others (eg. baseflow preservation).

BMP Selection Process

The BMP selection process which follows is designed to allow an initial selection of a set of candidate BMPs based on uses and resources to be protected or improved. The intent is that the uses made of the watershed drive the BMP selection process, and that from the outset, the selection process be oriented towards creation of a BMP plan rather than a single-use facility.

The first steps in the process involve identification of concerns, setting of priorities and establishing the basis for the plan. This will ideally be done at the watershed planning or master drainage plan level. Consultation with agency approvals staff will be required, however, regardless of the existence of these documents. This consultation should occur early in the process.

Based on the concerns established, a "long list" of potential BMPs is selected and subjected to a screening based on site specific considerations. Physical limitations of the site can eliminate certain BMPs. In addition, non-physical constraints are used to divide the feasible BMPs into two groups: those which seem to pose no problems; and those which may require special design

or trade-offs. The criteria used for dividing BMPs based on non-physical constraints need not be overly rigorous and may actually be simply a matter of proponent preference. This is not a concern because non-physical constraints are not sufficient to eliminate BMPs. The BMP selection process is predicated on the requirement that the combination of BMPs selected address all identified use concerns unless physical constraints intervene.

The next step is an assessment of the opportunities presented by the remaining BMPs. At this stage a BMP which was given a second priority in the previous step and which offers no distinctive opportunities, may be eliminated, so long as it is not the sole effective means of dealing with an identified concern. This opportunity assessment is often important in gaining approvals and public support. The idea of "mitigating impacts" is often seen as inadequate, and enhancements or improvements over existing (not necessarily natural) conditions are expected.

The BMPs which remain at this point are recommended for pre-design assessment in terms of costing, determination of maintenance requirements, sizing and siting. Typically by this stage, likely combinations of BMPs will have suggested themselves and it will often be more useful to evaluate a number of scenarios involving multiple BMPs rather than look at each BMP type individually. Based on the results of this assessment, the individual BMPs or scenarios are ranked primarily on the basis of cost, the fit with the development type, and the opportunities presented by the design. All scenarios evaluated must meet the entire list of concerns and any performance criteria which have been specified.

The final product is a selected BMP or set of BMPs which can be submitted for approval and carried forward in design. The BMP selection process should be documented in the SWM plan along with any deficiencies in meeting established concerns.

Monitoring and Maintenance

Special mention of monitoring and maintenance of BMPs is warranted. It is evident that while the implementation of stormwater BMPs is necessary to reduce impacts, we do not have a great deal of design experience or experience with the effectiveness of non-sediment related aspects of the facilities. Our knowledge is theoretical, or based on experience in different climates, or based on observations of natural systems which may not have been subjected to the same sorts of loads. Since the object of BMP design is to protect the aquatic resources of the receiver, it is critical that monitoring be conducted, first to confirm that the facility is working as designed, and second that it continues to work over time.

Continued operation over time is perhaps the greatest concern. The facilities are designed to accumulate sediment and contaminants. If these are not cleaned out and disposed of, the facilities will eventually cease to function and may actually become a liability. This is of particular concern because this may be expected to occur many years after development has been completed and attention has turned elsewhere. If a facility is to maintain base flow, temperature or suspended solids and it diminishes in effectiveness over time, the result may be a gradual degradation which may not be easily detectable or traceable to a given source.

While all forms of BMPs must be maintained, attention to infiltration facilities is most important. Experience in the U.S. indicates that lack of maintenance is the primary cause for failure or diminished effectiveness of this BMP type. The expected life of infiltration facilities is shorter than ponds (estimated 15 years) and periodic replacement will be necessary. Because many infiltration facilities are subsurface in nature, the problem of "out of sight, out of mind" may be expected to make maintenance particularly easy to neglect.

It is recommended that the proponent be responsible for the operation and maintenance of local BMPs for a period of four years from the completion of the development. The proponent would be responsible for ensuring that the necessary monitoring is performed, and that any required maintenance is carried out during this time. If the monitoring indicates that the BMP is not operating as designed, the problem should be rectified prior to acceptance by the municipality.

The municipality would be responsible for all operational and maintenance functions after the 4 year probationary period. The monitoring program can be relaxed after the 4 year probationary period but cannot be discarded. The BMP facility must be checked at least once every 3 years to ensure that it is operating efficiently.

Conclusion

This paper has been based on a study conducted by Marshall Macklin Monaghan Limited for the Ministry of the Environment. A project team composed of representatives from MOE, MNR, MTO, the Association of Conservation Authorities of Ontario, the Municipal Engineers Association, the Urban Development Institute, and the cities of Markham, Mississauga and Scarborough, provided overall project direction and comment. The study involved extensive consultation with many agencies and experts in the field, as well as a search of the existing literature. Technical conclusions are summarized from experience with BMPs in Canada and the United States with special emphasis on conditions in Ontario. In addition, conclusions are drawn with respect to the implementation of BMPs as recommended in the study. It is

anticipated that the next phase of the Ministry's BMP program, the development of a design manual, will be initiated in 1991.

The major technical conclusions of the study are listed below, followed by the study recommendations.

1. Numerous studies indicate that BMPs can be effective in removing contaminants, and therefore their implementation should be pursued and encouraged.
2. No single BMP type can be universally recommended. In many instances combinations of BMPs will be required to address a range of concerns.
3. There is limited experience with some types of BMPs in Ontario, most especially those involving infiltration or wetland techniques. Their use should be encouraged and monitored in selected areas.
4. The sediment which is trapped by BMPs will be contaminated and likely have some limitations on disposal options. BMPs are meant to concentrate contaminants rather than allowing them to spread throughout the ecosystem.
5. There is a seasonality of stormwater runoff, water quality concerns, and BMP effectiveness in Ontario. The effectiveness of infiltration BMPs in the winter and spring has been questioned and requires further research.
6. Groundwater contamination in infiltration BMPs is a prevalent concern due to the mobility of dissolved chlorides and nitrates. Their use should be carefully controlled in areas where water supply is a concern.
7. Dry ponds, which have seen widespread use for quantity control, are generally ineffective as a water quality BMP.
8. Wet stormwater ponds are not an all-encompassing solution to water quality problems. There are drawbacks associated with ponds (stratification, lack of baseflow augmentation, impact to surrounding environment) which must be recognized when selecting possible BMP solutions.

9. Vegetative BMPs are typically not effective enough to be utilized as the sole type of stormwater quality control in most development applications. They do however represent a valuable supplementary BMP which should be encouraged in conjunction with storage and infiltration BMPs.
10. Issues of aesthetics, safety, and liability arising from the implementation of BMPs can be satisfied by specific design features.
11. Ongoing maintenance and in some cases, periodic replacement, of BMPs is extremely important to ensure effectiveness. Lack of regular maintenance has been the main cause of BMP failure.

Recommendations

1. Stormwater BMPs should be implemented in all new developments or redevelopments using the BMP selection process outlined in this report.
2. The proponent should be responsible for construction of BMP facilities.
3. New development monitoring should be used to ensure the effectiveness of stormwater quality measures. If a BMP is not shown to be operating as designed, corrective measures should be undertaken and effectiveness demonstrated prior to the municipality assuming the facility.
4. The use of a stormwater utility should be investigated to pay for the long term maintenance of stormwater BMPs. Pending action in this regard, municipalities should be responsible for BMP maintenance.
5. BMP studies should be undertaken at two levels. Demonstration studies designed to collect immediate information regarding BMP operation at existing or currently designed facilities, should be undertaken immediately. Comprehensive pilot studies which will involve detailed monitoring and operational testing of BMPs should be undertaken over the next five years.
6. Six infiltration BMP pilot studies and three wet pond BMP pilot studies should be undertaken to determine the winter/spring operation of these types of BMPs. The pilot

studies should be based on BMPs designed in accordance with the recommendations outlined in this report.

7. Pilot studies should seek to address:
 - a) winter/spring operation of wet ponds and infiltration BMPs
 - b) receiving water effects from dissolved versus suspended solids
 - c) receiving water improvements from BMP implementation
 - d) standard monitoring methods
 - e) bio-accumulation of stormwater contaminants
 - f) Canadian BMP design standards
 - g) pollutant first flush time of concentration on a watershed basis
8. An Ontario BMP design manual should be produced based on the findings of this study. An expert system version of this manual should be produced to increase BMP awareness among non-technical personnel, promote water quality education, and to demonstrate the linkages between planning and stormwater management.
9. Reviewing agencies should encourage innovative BMP designs, and be flexible concerning agency criteria. Since inter-agency conflicts can only be resolved through modified designs or modified criteria, agency inflexibility will cause lengthy and frustrating water quality approvals.

DOW'S INITIATIVE TOWARDS
SPILL REDUCTION

by

Jorma Salmikivi, Manager,
Environmental Services,
Dow Chemical, Sarnia,
Ontario

First of all, let me thank the organizers of this conference for the opportunity to talk to you about Dow Sarnia Division's initiatives on spill reduction. My purpose here today is to dialogue with you about what we at Dow Sarnia Division are doing to virtually eliminate spills to the St. Clair River

If I succeed in my presentation, I will have accomplished the following:

1. Explained what our "vision" is for the Sarnia Division.
2. Described the process that will allow us to accomplish the "vision".
3. Introduced you to the challenges we face. Why those challenges exist and what we are doing about them.

AERIAL VIEW OF SARNIA DIVISION

First, let me just take a few moments to orient you to the Sarnia Division:

- located on the St. Clair River
- Dow's first international venture
- integrated plant site - 14 mfg. plants on the site.
- site originally designed according to 1940's standards
 - combined sewer systems
 - underground concrete or tile sewers
 - heavy reliance on once through cooling water.
 - seven discharge points to the river
 - over 1500 pathways to the sewer system

The challenges that we face may be specific to our site - specific to our manufacturing technology - specific to our location on the St. Clair River. However, I don't believe these challenges are unique to Dow. Many companies and I am sure that many of you at this conference are going through similar challenges.

Our Commitment

- We are sensitive to the concerns of the public and accountable to them for our decisions and actions.
- We believe in the responsible integration of environmental and economic considerations in all decisions affecting our operations.
- Our goal is the elimination of wastes and emissions

(from Global Environmental Guidelines)

Sarnia Division Vision

We will achieve environmental excellence in all our operations and thereby ensure our success as a global competitor and fulfill our commitment to not adversely impact the environment.

Increasing Environmental Commitment

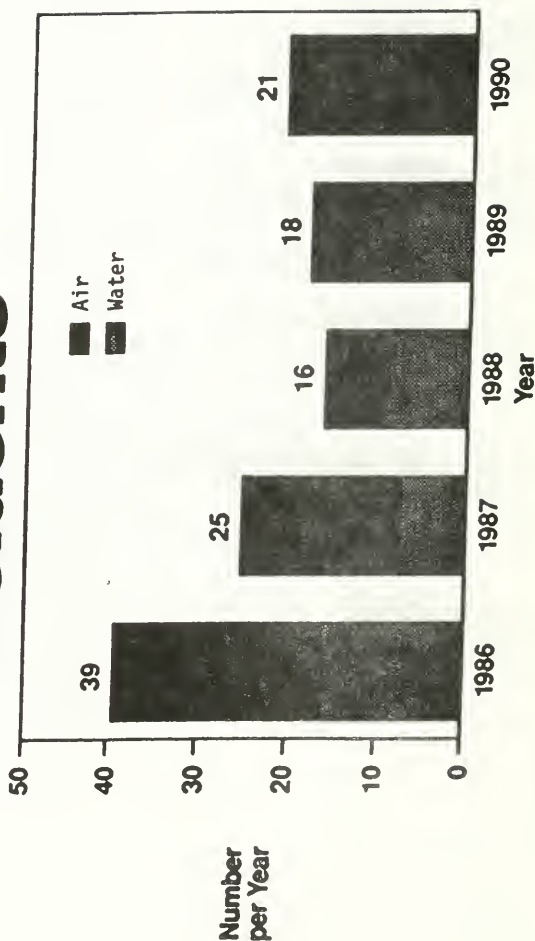
- \$50 million dollars spent on environmental improvement projects over past 10 years
eg. 1982-1985 \$ 8.7 million
1986-1989 \$18.8 million
- We are committed to spending \$8-10 million a year for the next several years

MINISTRY REPORTABLE GRAPH

With this level of commitment let's examine two of our performance report cards. This graph represents the number of Ministry Reportable Incidents at our site.

- represents incidents to all media: air, water, land
- 1986 - 1990 represents 46% reduction in spills.
- last three years have been flat wrt water related incidents
- management concern over this performance - does not reflect our philosophy of continuous improvement
- bottom line:
 - with 1500 entry points to river we will always be vulnerable to spills
- long term:
 - get off the river.
 - BUT it takes time to design and install capital improvements.
- short term:
 - maintain high level of sensitivity and awareness
 - since Dec. of last year even the most minor incident requires management level investigation. This is on top of an already demanding incident investigation procedure that has been in existence for years.
 - rigorous follow-up to ensure no repeat incidents.

Ministry Reportable Incidents

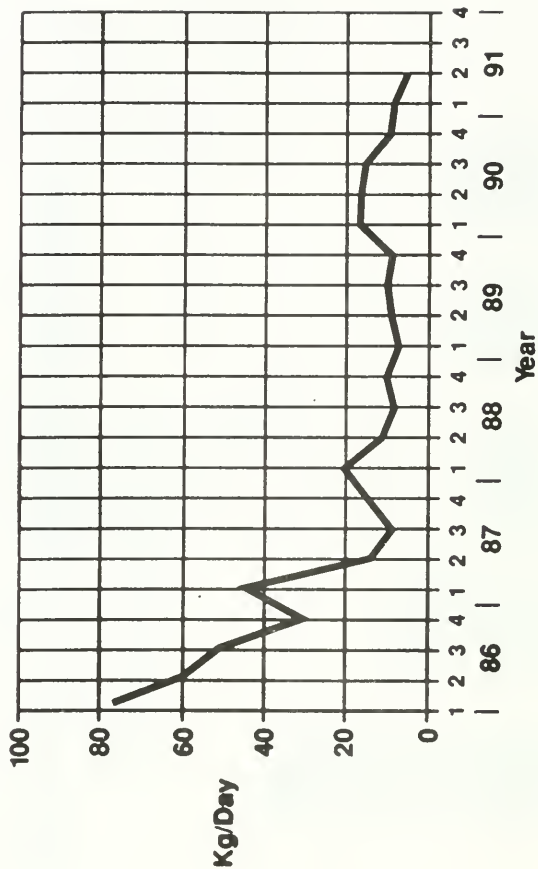


PRIORITY POLLUTANTS GRAPH

This is our performance wrt loadings to the river:

- 94% reduction in priority pollutant loadings to the river since 1986. A tremendous achievement.
- flattening out in 1988 - 1989 is because the known sources had been isolated. This 5-8 kg/day loading primarily due to historical contamination that is finding its way into the sewer system. These are concrete sewers - designed to leak in and designed to leak out. If contaminant finds a pathway to the sewer system, it will get into the sewer through joints.
- this is exactly what happened early in 1990 as shown by the elevated levels.
- solution - \$500K to replace first section of the sewer to get us back to historical levels.
- currently in the field to replace the last section - \$800K; i.e. \$1,300K to solve this problem.
- however, this does not eliminate all of the contaminants to the sewer system and as stated before all of the main point sources had been eliminated. Therefore, to reach the next level of improved performance, a radically new approach had to be taken and in Dec. 1989 we announced our RIVER SEPARATION PROJECT.

Priority Pollutant Loadings



The River Separation Project

Goal:

To virtually eliminate all spills and harmful discharges to the St. Clair River by the year 2000.

A Continued Commitment:

Past capital spending has focussed on abatement and spill prevention: key elements of the River Separation Program.

RIVER SEPARATION PROJECT

GOAL

WHAT DOES THIS MEAN:

- all effluents will be contained, treated, analysed prior to release
- it will take us until the year 2000 to accomplish this

IT DOES NOT MEAN

- there will be no effluent flowing to the river
- that we will not see results until the year 2000. In actual fact we should see the biggest benefits in spill reduction in the next 5 years.

Priorities for Improvement

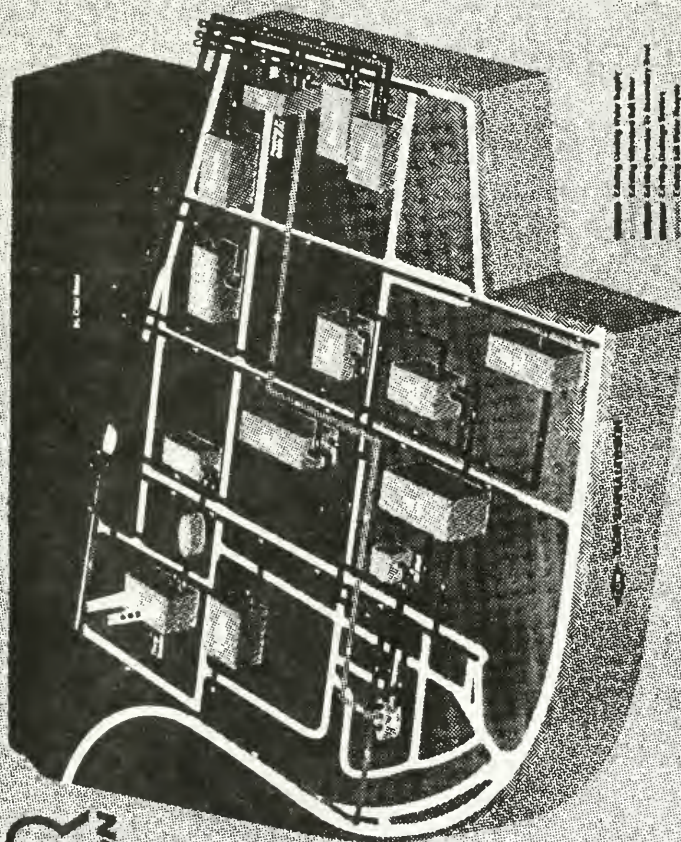
	Process Water	Drainage	Cooling Water
% of total volume	2-3%	0.3%	97-98%
% or organics discharged	<25%	>75%	-
% of spills	14%	79%	7%

PRIORITIES FOR IMPROVEMENT

Let me try to put the opportunity we have in front of us in some form of perspective for you:

- use 170,000 gpm of water from the river
 - x 10 - Sarnia
 - x 5 - London
- water returns to river either as once through cooling water or as process water
- in addition rainfall averages approx. 500 gpm - collected by our storm water drainage system and discharged to the river.
- all the water flows into a combined sewer system; i.e. cooling water, process water and storm water run-off are all combined in our sewer systems prior to discharge.
- cooling water - 97-98% of total discharge; therefore a great deal of dilution takes place.
- the system that accounts for greater than 75% of the organics discharged and 79% of the spills is our drainage system BUT it is also by far the smallest flow.
- obvious that if we have any chance of installing abatement technology, we first have to separate / segregate the sewer systems - remove the clean cooling water from the contaminated water and then treat the smaller more concentrated "dirty" stream. This is the basis of our overall strategy.

RIVER SEPARATION Basins



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- 90. Inlet
- 91. Outlet
- 92. Inlet
- 93. Outlet
- 94. Inlet
- 95. Outlet
- 96. Inlet
- 97. Outlet
- 98. Inlet
- 99. Outlet
- 100. Inlet

BASELINE MAP

This slide illustrates what we have in place right now. You will note:

- combined sewers discharging to the river from multiple plants- total of seven discharge points.
- Biox treatment facility treating mainly effluent from our P.O. Plant.
- other plants also send their process water to the Biox plant but this is a small % of the total flow.
- all of the other plants either recycle or have projects in place to recycle all their process water or have a treatment system as part of their process.

Drainage Water

Typical sources:

- Rain/snow
- Fire water (deluge)
- Wash water (hoses etc.)

Flow:

- Avg. per site from precipitation
- 25 yr. storm (max. daily)
- Fire water (max. instantaneous)

450 USGPM
35 MMUSGPD
10,000 USGPM

Drainage Water

Strategy:

- Install new cooling water sewers
- Existing sewers remain on drainage service
- Divert drainage to a holding tank or basin
- Treat if required
- Recycle internally, where possible
- Release excess to river

Challenge:

- Retrofit old congested plants with major new piping
- 1500 entry points for drainage
- Site congestion and volume required to hold 25 year rain and/or extended deluge
- Estimate treat needs and design for wide variations
- Water balance

DRAINAGE WATER: STRATEGY CHALLENGE

- sewer separation / segregation is key as has been mentioned previously.
- new cooling water sewers will be installed leaving the existing sewers to handle the drainage.
- our challenge is to manage the sheer logistics of doing this inside operating plants - most of which are old and congested.
- there are 1500 entry points into the sewer system which have to be managed as part of the scope of this project.
- once the sewers have been segregated, the drainage can be diverted to a holding tank or basin - treated if required - recycled where possible with the excess released to the river with the appropriate level of monitoring.
- precipitation, and deluge water add to our concerns of a very tight water balance. We have very little water purge out of our system, which essentially means that to be in balance we need very little fresh water from the river. As a matter of fact precipitation and deluge exceed our purge out of the system. We need to find a purge out of the system - otherwise the excess will have to be released to the river - after treatment.
- for us, site congestion and volume required to hold 25 yr. rains and extended deluge trips is a major challenge that can only be overcome with money and creative engineering.
- the high degree of variability in the treatment requirements will also require some careful engineering to ensure the right amount of flexibility in the process.

TYPICAL ISBL DIAGRAM

-when this part of our work is completed, each one of our plants will have a redesigned sewer system that will look something like this :

- new collection headers installed for cooling water
- drainage water collected, contained, treated if required prior to discharge.
- recycle opportunities will be sought.

-NOTE: - our site consists of a number of distinct manufacturing plants. What I have shown here is what each plant has to do; in other words, this concept has to be repeated at least fourteen times within the site.

[illegible]

INTERMEDIATE MAP

- let's look at our site diagram to see what has happened to the overall site:
 - sewers have been segregated
 - a central treatment facility is in place
 - once through cooling water is still returned to the river.

Process Water

Typical sources:

- Biox effluent (salt water)
- Pond effluent
- Scrubber/stripper water
- Rail car wash effluent
- Ion exchange regeneration water

Approximate flow:

- 4,000 USGPM

Process Water

Strategy:

- Reduce at source
- Divert balance to treat
- Maximize internal recycle
- Surplus to river

Challenge:

- Technology limitations
- Treat plant variability
- Water balance

PROCESS WATER STRATEGY / CHALLENGES

- first real opportunity to practice the 3R principles
- reduction at the source has got to be the prime focus
- remainder has to be treated before recycle with the excess being discharged to the river under controlled conditions.
- for the Sarnia Division, reduction has already been achieved in many areas through higher levels of operating discipline and tighter control of unit operations - especially scrubbers.
- recycling water (e.g. scrubber water) has significantly reduced the quantity of process water discharged. Work is still currently progressing in those areas that have not completed this work.
- further major reductions will require process technology changes. Availability of process technology is a significant limitation on our ability to get into balance with water use. However, R&D work is progressing with some favourable initial results.

Cooling Water

Typical Sources:

- Shell and tube, or plate and frame heat exchangers
- Approximately 275 river water cooled exchangers

Approximate Flow:

- 170,000 USGPM

Cooling Water

Strategy:

- Prioritize exchangers
- Evaluate closed loop options
- Convert high priority exchangers to closed loop

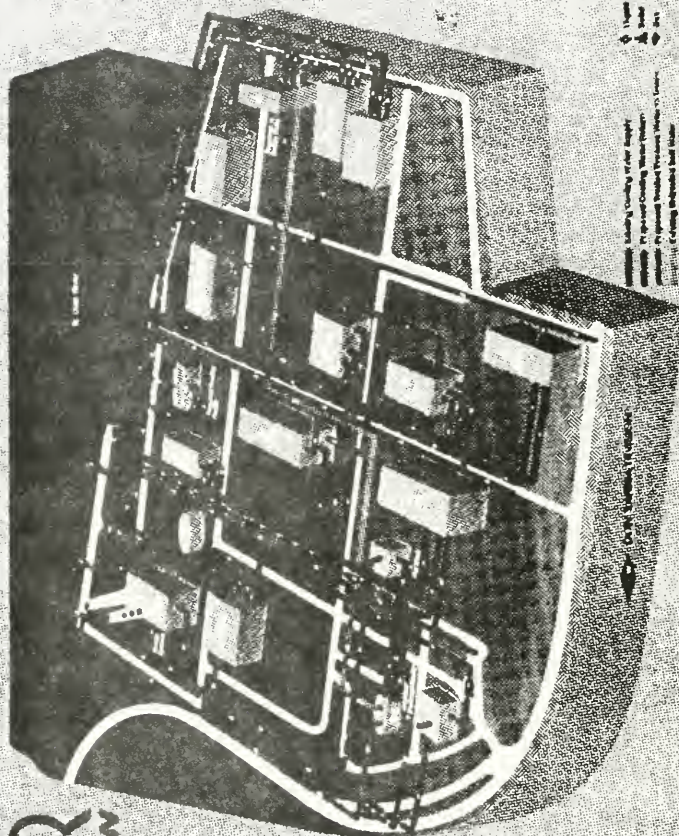
Challenge:

- Number of exchanges on site approximately 275
- Site congestion with respect to cooling tower installation
- Blow down disposal
- Hotter cooling water/reduced heat exchange capacity.

COOLING WATER STRATEGY / CHALLENGE

- An Engineering team has evaluated and prioritized each exchanger on the site using the nature of the chemical and its potential impact on the environment as assessment criteria.
- thrust is to evaluate closed loop options, including cooling towers and convert high priority exchangers to a closed loop system.
- also evaluating air cooled exchangers instead of water cooled ones. This obviously means a complete replacement of existing exchangers.
- the challenges faced here can mainly be solved with existing technology - although the options are very expensive. The sheer number of exchangers, and the need to replace some exchangers or add water refrigerant units to compensate for the higher water temperatures add to the complexity and cost of the initiative.
- it also should be noted that while cooling towers solve some environmental problems, it can also create others - e.g. the chemical treatment of closed loop water and the need to dispose of blowdown water.

RIVER SEPARATION Complete



• 1000
 • 2000
 • 3000
 • 4000
 • 5000
 • 6000
 • 7000
 • 8000
 • 9000
 • 10000
 • 12000
 • 15000
 • 20000
 • 25000
 • 30000
 • 35000
 • 40000
 • 45000
 • 50000
 • 55000
 • 60000
 • 65000
 • 70000
 • 75000
 • 80000
 • 85000
 • 90000
 • 95000
 • 100000

FINISHED MAP

Having completed each phase of the project as described, by the year 2000, our site should look somewhat like the slide you see in front of you.

- a central treatment facility in place
- all storm water and process water contained, analysed, treated and monitored during release.
- one discharge point to the river
- all water cooled process exchangers on a cooling tower system
- cooling tower make-up using recycled water

Summary: Work Underway

Here's a sampling of what we're working on today:

- Drainage water containment: \$18 MM
- Water treatment containment at power plant: \$2.1 MM
- Sewer replacement: approx. \$1 MM

ZEBRA MUSSELS - STRATEGIES AND PROPOSALS
FOR CONTROL

by
A.B. Braganza, Approvals Branch, Environment
Ontario, Toronto, and C. Brousseau, Program
Co-Ordinator, Ministry of Natural Resources,
Maple, Ontario

Arthur Braganza

The invasion of the zebra mussels into the lower Great Lakes is creating a very serious problem at water treatment plant intakes and industrial facilities in Ontario, such as Ontario Hydro, Ford and General Motors which draw large quantities of raw water from these lakes.

Many of the chemicals and non-chemical options of dealing with the prevention, control or removal of the zebra mussels infestation in these facilities are in the experimental stage to determine the efficacy and degree of control achievable by each option.

Ontario Hydro is providing a lead role in researching control options which include chemicals, physical and mechanical mitigation options including the development of mechanical cleaning techniques. Their research into long term control measures includes investigating the use of ozone, acoustics, mechanical filtration, thermal shock, pressure and antifouling coatings.

Several oxidizing chemicals have been tested by various agencies for their effectiveness against both the zebra mussel veliger and adult. Commercial non-oxidizing chemicals have also been tested successfully in the United States for use in industrial and municipal applications.

While there are a number of possible approaches to addressing the buildup of zebra mussels in water intakes, the most effective in the short term, as agreed to both Federal and Provincial agencies, is the use of chlorine (as chlorine gas or sodium hypochlorite). In order to deal with the zebra mussel problem it was necessary to amend the Regulation under the Pesticides Act to provide for the use of a "water treatment chemical" as authorized under the Ontario Water Resources Act by an approval or a permit to take water.

Implementation of the short term solution will allow for the research, development and implementation of long term solutions including ozonation, physical and mechanical processes, etc. It will also provide for the development of a long term comprehensive zebra mussel management strategy.

The MOE Zebra Mussel Committee initiated the short term control option as defined in the publication known as the "Guidelines on Applying for the Approval of Water and Sewage Works to Deal with Zebra Mussel Control". The "Guidelines" include sections on the application of chlorine, conditions of use, and Terms and Conditions which are included on the Approvals of the works issued under the Ontario Water Resources Act. The optional program for zebra mussel control is to monitor the pipe intakes for the presence of zebra mussels and to provide chemical treatment in order to prevent the zebra mussel in the veliger stage (free floating form) from settling and attaching itself to the inside of the pipe.

An outline of the requirements by the Ministry of the Environment with respect to applications for the approval of works subject to zebra mussel problems is dealt with in the slide presentation. (Ed. Not made available for inclusion).

Zebra mussels have caused significant damage to water users in lakes St. Clair and Erie. This animal is rapidly spreading throughout the rest of the Great Lakes. Negative impacts on Ontario's multi-million dollar commercial and sport fisheries are expected. The potential damage to Great Lakes users, both American and Canadian, from zebra mussels has been estimated at 5 billion dollars over the next 10 years.

Similar, perhaps even more significant effects, will occur when the mussel invades inland waterways where the potential for damage to fisheries and recreation, including boating and cottaging is very high.

Problems include how to slow or prevent the spread of the mussel, how to develop mitigative/repair methods, and how to investigate means to control wherever possible. Significant efforts in research, inventory and assessment are necessary to understand and respond to the problem.

Recent media reports of solutions to this problem such as the soapberry and potassium phosphate, are not realistic. An environmentally safe chemical control at specific intake sites will not likely be developed and approved for the next several years.

In order to respond to public concern over this problem, MNR and MOE have undertaken the following initiatives in 1990/91

- 1. Communications and Education Plan**
- 2. Assessment, Research and Monitoring**
- 3. Utility Operations**
- 4. Establishment of a Zebra Mussel Coordinating Office**

A strategy has been completed by the Ministries of the interministerial Coordinating Committee (MNR, MOE, MIA, MTR, MMA, MTE + Ont. Hydro). The strategy defines the roles of the two key Ministries (MNR and MOE). MNR's role is defined as follows: MNR would be the lead Ministry responsible for program coordination, implementing a corporate communications plan on behalf of all Ministries, monitoring the distribution, spread, and abundance of zebra mussels, determining the impacts of zebra mussels on the aquatic environment and Provincial Park and Fish Culture Station water intake modification.

MOE's role is determining impacts on water quality and bioaccumulation, research into alternate control methods and assistance to municipalities in modification of water intake structures.

ONTARIO'S SAFE DRINKING WATER ACT

by
Dr. Jim Ashman, Director, Water Resources
Branch, Environment Ontario, Toronto -
Presented by Dr. Ken Roberts, Manager,
Drinking Water Section, Water Resources
Branch, Environment Ontario, Toronto

Drinking water is not currently regulated in the province. Nevertheless, a good quality product is produced. The quality of drinking water is compared to the Ontario's Drinking Water Objectives and the Canadian drinking water Guidelines. Although the 100 health related guidelines are not enforceable, if exceeded, immediate remedial action is taken by the Ministry and water supply operators.

The Drinking Water Surveillance Program, which has been in place since 1986, currently provides information on drinking water quality for 85% of the population of the province. Approximately 180 parameters are tested on a regular basis from over 80 water treatment plants. These include plants utilizing ground and surface water sources.

Although the DWSP provides accurate and readily accessible data on plants being monitored in the program, there are several issues which need to be addressed. The SDWA will cover these issues. For example, public participation in standard setting is needed to alleviate fears and negative public perception. The SDWA has a

major public consultation component.

Currently the DWSP includes 85% of the province's municipally treated drinking water; however, there are approximately 400 municipal and numerous rural supplies not included. The act will ensure appropriate monitoring of all supplies.

Under current legislation, sources producing water not meeting the Ontario Drinking Water Objectives cannot be penalized. Development of standards will change this.

Passage of the act should increase public awareness regarding the quality of drinking water.

Initially, the act will be drafted to cover water works prescribed by the Ontario Water Resources Act. These are plants producing more than 50,000 litres per day or supplying more than 5 residences. It is not intended that bottled water and home treatment devices be considered under the act, as utilization of these items is strictly the consumers choice and as bottled water is currently defined as a "food" under the Federal Food and Drugs Act. Development of the Act will include a major public consultation process including other government agencies, public interest groups and environmental groups.

It is proposed that the SDWA be comprised of five major components; enforceable standards for contaminants in drinking water, minimum

treatment standards, public notification of drinking water quality, compliance assurance through extensive monitoring and public participation in standard setting.

With respect to the first component, it is proposed that current guidelines outlining maximum levels for contaminants based on human health effects be converted into standards. Development of standards for contaminants not included in current guidelines would also be conducted. A major portion of the standard setting procedure will involve public consultation coordinated through MOE's Advisory Committee on Environmental Standards (ACES). Once an ACES standard has been proposed by the Ministry, ACES would provide 6 months to review to standard and provide recommendations to the Minister.

As currently proposed, these standards, in fact, the entire legislation would not be applied to individual wells. This may cause some discontent, since the rural household may expect the same quality of drinking water. Inclusion of well water, at a later date is being considered.

An important component of all drinking water production is the treatment process itself. The development of minimum treatment standards would ensure the continual production of good quality drinking water. Currently the Ministry has a minimum treatment policy which outlines minimum treatment for surface and ground water. Surface waters require, as a minimum, disinfection,

filtration, coagulation and flocculation, while groundwater requires only disinfection. It is anticipated that this current policy would be incorporated into the act. The minister would have the right to enforce minimum treatment standards at any time.

In all surface water supplies, there is a potential for the presence of disease causing agents such as viruses, giardia and cryptosporidium. Testing for these agents is very difficult so enforcement of minimum treatment standards would ensure that these agents are not present in the finished product.

Included in the act there will be a section on source protection. As I have indicated before, degradation of any source can lead to costly treatment processes. Within the act the Ministry will have the authority to restrict water use. Activities such as swimming and bathing, discharges into the source and the quantity used can be restricted. In addition to water use, the Minister will be able to restrict certain land use if it is shown that the source will be compromised. Source protection may affect the farming community depending on the quantity of water utilized for irrigation, the type of runoff entering the source and land use activities conducted. I would point out that this is nothing new here as the authority currently exists within the Ontario Water Resources Act.

Enforcement of the standards cannot be conducted unless some type of monitoring is carried out. The supplies of drinking water (i.e. the municipalities) will be responsible for monitoring the quality

of the finished drinking water to ensure it is in compliance. Monitoring, at a minimum, will include both raw and treated water which will be analyzed for all parameters for which health related standards exist.

In the event of a standard being exceeded, the owner of the water supply will be required to notify the Minister, the Medical Officer of Health and the public. In addition, the owner will be responsible for the provision of an annual summary report detailing contaminant levels.

These will also be included in the act, an enforcement component. Enforcement will be achieved through the issuance of orders. Different types of orders will be issued depending on the nature of the non-compliance. When out of compliance, the owner will be required to take remedial action. To ensure that this is carried out, a remediation order may be issued. If this is not followed, than an offence will have been committed. Other offenses include; not giving required notices, failure to monitor and introduction of a contaminant to the water. Associated with each offence, there will be a fine of \$100,000 for a first offence and \$200,000 for any subsequent convictions.

It is also intended that the Act would contain certain other provisions for administration and enforcement. The act also contains provision of a Safe Drinking Water Program. As the purpose of this program is to ensure that the water treatment plant

is operating at the optimum level in terms of treatment practices and quantity produced, the legislation will authorize inspections and investigations to be conducted. Environmental officers will have the authority, under the act, to enter buildings and homes in order to carry out inspections and investigations. Orders specifying steps to be taken to put the plant into compliance can be issued. These steps can include the purchase of updated equipment or the actual redesign of the treatment process.

In summary, the legislation, once enacted, will provide health benefits in terms of potentially decreasing the incidence of long term health problems and minor illnesses resulting from consumption of drinking water. By implementing enforceable standards the public will perceive that they are consuming a better and safer drinking water. The instigation of minimum treatment standards will result in the upgrading of some water systems and thus provide increased protection against pathogenic microorganisms.

At the current time the safe drinking water act is awaiting review and approval by cabinet. Once this approval has been obtained, extensive public consultation will be carried out prior to completion of both programs.

The Ministry feels that implementation of both programs will ensure that the people of Ontario will be ensured the continual supply of safe drinking water.

SESSION IV – WASTE – PRIVATE SECTOR INITIATIVES



Moderator: Jim Temple, Director
Ontario Waste Management Association
Toronto, Ontario



Jon Grant, President, The Quaker Oats
Company of Canada Ltd.,
Peterborough, Ontario



Bob Webb, Business Development
Manager, WMI Waste Management of
Canada Inc., Toronto, Ontario



Al Schuidt, Director, Environmental
Control, Stelco Steel,
Hamilton, Ontario



P. Douglas Sirrs, Environmental
Engineer, General Motors of Canada,
Oshawa, Ontario



Michael Scott, President,
Canadian Polystyrene Recycling
Association, Toronto, Ontario

LESS WASTE, MORE EFFICIENCY - QUAKER'S
STRATEGY FOR PROFITS

by
Jon Grant, President, The Quaker Oats
Company of Canada Ltd., Peterborough,
Ontario

I WANT TO BEGIN WITH A WORD OF THANKS TO THE MINISTRY OF THE ENVIRONMENT AND THE WASTE REDUCTION OFFICE IN PARTICULAR FOR SPONSORING OUR GATHERING THIS WEEK.

FOR THOSE OF US WHO'VE BEEN OUT POUNDING OUR OWN PAVEMENTS IN SUPPORT OF ENVIRONMENTAL LEADERSHIP FROM THE BUSINESS COMMUNITY, I WANT TO TELL YOU THAT WE DO APPRECIATE YOUR EFFORTS, WHICH ARE BOTH TIMELY AND WELCOME.

I HAVE TO ADMIT BOTH SURPRISE AND PLEASURE AT THE DISCOVERY THAT THIS CONFERENCE IS NOW IN ITS 38TH YEAR.

WHILE MANY OBSERVERS ARE PRONE TO SEE WASTE MANAGEMENT AS A RELATIVELY NEW KID ON THE BLOCK THESE DAYS, IT SEEMS TO ME THAT AT 38, WASTE ISSUES ARE IN RELATIVELY DANGEROUS PROXIMITY TO MIDDLE AGE.

THE PROBLEM, OF COURSE, IS THAT THIS MIDDLE AGE HAS NOT BEEN ACCOMPANIED BY THE CHARACTERISTICS OF SETTLING AND SERENITY THAT SOME MIGHT EXPECT.

FAR FROM IT.

THE FACT IS THAT THE QUESTIONS BEFORE US TODAY HAVE AN OBVIOUS AND PERSISTENT STAYING POWER.

AND THEY VIRTUALLY CRY OUT FOR A WHOLE NEW WAY OF THINKING ABOUT WASTE, -- ABOUT WHAT IT IS, AND ABOUT HOW IT CAN BE INTELLIGENTLY MANAGED IN THE 1990'S.

THIS AFTERNOON, I WANT TO REFER TO OUR OWN CORPORATE EXPERIENCE IN NEW THINKING AND NEW ACTION AT QUAKER OATS CANADA.

BUT I ALSO WANT TO OUTLINE SOME BIGGER PICTURES AND BIGGER PROSPECTS.

★ ★ ★ ★

SOME OF YOU WILL KNOW THAT THE LARGEST LANDFILL SITE IN THE WORLD IS RECLAMATION PLANT NO. 1 AT FRESH KILLS, STATEN ISLAND, NEW YORK.

IN ONLY ITS FIRST FOUR MONTHS OF OPERATION IN THE SPRING OF 1974, IT RECEIVED OVER HALF A MILLION TONS OF NEW YORK CITY WASTE BROUGHT TO IT BY SOME 700 BARGES.

MOST OF YOU WILL REMEMBER THE RECENT SAD SAGA OF MORE BARGES WITH MORE NEW YORK CITY WASTE DESPERATELY SEEKING ANY SANCTUARY FOR THEIR USELESS CARGO.

THE QUESTIONS ARE FORCED UPON US TIME AND AGAIN: IS OUR PROBLEM ONE OF TOO MUCH WASTE OR TOO LITTLE CAPACITY FOR DISPOSAL? DOES OUR DEMAND FOR GOODS AND PRODUCTS EXCEED OUR SUPPLY OF SOLUTIONS FOR THEIR DISPOSAL?

AND I THINK WE ALL UNDERSTAND THE ECONOMIC DYNAMICS AT PLAY HERE: HOW MUCH CAN WE ABSORB IN THE WAY OF NEW ENVIRONMENTAL COSTS WHILE REMAINING COMPETITIVE? WHAT WILL GOVERNMENT REGULATION MEAN IN TERMS OF PROFIT MARGINS AND MARKET SHARE, AND HOW DO WE MEASURE AND BALANCE THE VALUES AND THE TRADE-OFFS INVOLVED?

LET ME COME QUICKLY TO THE POINT.

I BELIEVE THAT THESE ARE THE WRONG QUESTIONS. THEY DON'T LEAD US TO THE NEW ORDER ANSWERS THAT ARE SO DESPERATELY NEEDED THESE DAYS.

I FIND THESE QUESTIONS ON ENVIRONMENTAL AND ECONOMIC TRADE-OFFS AND THE ASSUMPTIONS THAT UNDERLIE THEM TO BE OLD HAT.

THE PROBLEM WITH TRADE-OFFS LIKE THESE IS THAT THEY FORCE US TO DEAL WITH THE DISTANCE BETWEEN THINGS.

THEY CREATE REDUCED EXPECTATIONS AND LOWERED HORIZONS. THEY ENCOURAGE COMPARTMENTALIZED THINKING, -- ITSELF A FORMULA FOR MEDIOCRITY.

I WOULD SUBMIT TO YOU THAT THE RESPONSIBLE PATH TO ECONOMIC DEVELOPMENT AND WASTE MANAGEMENT REQUIRES A DIFFERENT SET OF QUESTIONS ALTOGETHER.

QUESTIONS THAT HAVE TO DO WITH A FUNDAMENTALLY DIFFERENT VIEW OF THE RELATIONSHIP BETWEEN ECONOMIC AND ENVIRONMENTAL PERFORMANCE.

QUESTIONS THAT PAY HEED TO THE EVOLVING ETHIC OF CONSERVATION; OF REDUCE, REUSE AND RECYCLE; OF A GROWING PUBLIC RESPECT FOR THE NATURAL COMPONENTS OF THE CYCLES OF EARTH AND LIFE; AND OF THE CLEAR AND COMPELLING PUBLIC DEMAND FOR STEWARDSHIP AND GUARDIANSHIP OF OUR NATURAL RESOURCES.

QUESTIONS THAT ENCOURAGE A FUNDAMENTALLY DIFFERENT MINDSET THAT HAS MORE TO DO WITH COOPERATION THAN CONFRONTATION; MORE TO DO WITH THE HOLISTIC THAN THE SEGMENTED; AND MORE TO DO WITH STEPPING STONES THAN STUMBLING BLOCKS.

I BELIEVE THAT THE ANSWERS TO THESE QUESTIONS LIE IN A RECOGNITION OF THE BREAKDOWN OF A NUMBER OF FUNDAMENTAL PRINCIPLES OF THE PAST.

AND I WANT TO MENTION JUST FOUR OF THEM.

THE VERY CONCEPT OF SUSTAINABLE DEVELOPMENT EMBODIES ONE SUCH BREAKDOWN -- THAT OF THE POLARIZED ATTITUDES OF GROWTH VERSUS NO-GROWTH. WE HAVE NOW MOVED WELL BEYOND THESE BLACK AND WHITE VIEWPOINTS OF THE PAST INTO A SYNTHESIS PERSPECTIVE IN WHICH MODERATE VIEWS FROM BOTH SIDES CAN BE ACCOMMODATED.

THE BREAKDOWN OF THE "US VERSUS THEM" SYNDROME TELLS A SIMILAR STORY. YESTERDAY'S ENVIRONMENTALISTS ARE TODAY'S ENTREPRENEURS, AND IN THE EXTENDED FAMILY OF ENVIRONMENTAL ACTIVISTS, IT IS GETTING HARDER TO TELL THEM APART. A PRO-ENVIRONMENTALIST ENTREPRENEUR WHO RECYCLES WASTE AND MAKES A PROFIT NOW HAS REAL DIFFICULTY IN FINDING AN EASY DEFINITION ON THIS SPECTRUM.

THE SAME CAN BE SAID FOR THE TRADITIONALLY POLARIZED VIEWS OF GOVERNMENT AND BUSINESS. OUR MUTUAL INTERESTS IN THE LONGER TERM ARE NOW MORE VISIBLE, AND ARE EASIER TO IDENTIFY. OUR JOINT EFFORTS NOW HOLD IMPROVED PROSPECTS FOR VOLUNTARY AND INTELLIGENT SOLUTIONS TO WASTE MANAGEMENT ISSUES.

A THIRD BREAKDOWN INVOLVES THE OLD MODEL OF LEFT VERSUS RIGHT, WHICH NOW APPEARS TO BE GIVING WAY TO A WHOLE NEW SPECTRUM DEFINED BY THE DOMINATION OF EARTH RESOURCES ON ONE HAND, AND BY COOPERATIVE COEXISTENCE WITH THESE RESOURCES ON THE OTHER.

PERHAPS THE MOST SIGNIFICANT OF THE PRINCIPLES OF THE PAST IS THE NOTION THAT ENVIRONMENTAL PROGRESS IS A LUXURY THAT WE SIMPLY CAN'T AFFORD.

YOU'VE HEARD THIS THESIS BEFORE: IT HOLDS THAT CORPORATE PROFIT MARGINS AND SHAREHOLDER DIVIDENDS MUST RECEIVE A HIGHER PRIORITY THAN WASTE RECOVERY OR RECYCLING, AND PARTICULARLY SO DURING TOUGH ECONOMIC TIMES LIKE THESE.

IN ESSENCE, WE'RE TOLD THAT PROGRESS ON THE ENVIRONMENTAL FRONT IS NICE BUT NOT NECESSARY, AND IT SHOULD STAY ON THE BACK BURNER UNTIL A STRONGER ECONOMY CAN PROPERLY SUPPORT IT.

LET'S BEGIN TO PEEL AWAY SOME OF THESE LAYERS.

ECONOMIC PRODUCTIVITY AND ENVIRONMENTAL CONSERVATION HAVE LONG BEEN PORTRAYED AS OPPONENTS, BATTLING FOR THE HEARTS, THE MINDS AND THE WALLETS OF CONSUMERS.

BUT CONSUMERS DON'T BUY INTO THIS CHOICE BETWEEN PRODUCTIVITY AND CONSERVATION: THEY WANT QUALITY, PRICE AND ENVIRONMENTAL FRIENDLINESS, AND ALL AT THE SAME TIME.

IN OTHER WORDS, THEY WANT THEIR CAKE; THEY WANT TO EAT IT, TOO; AND THEY'D LIKE IT TO BE GREEN.

AND SHOULDN'T WE ALL FEEL THE SAME WAY?

THE MYTH THAT JOBS MUST ALWAYS TAKE PRECEDENCE OVER ENVIRONMENTAL CONCERNS IS NO LONGER ACCEPTABLE TO MOST PEOPLE. EMPLOYEES WILL NOT SETTLE FOR THE ENVIRONMENTAL IRRESPONSIBILITY OF THEIR EMPLOYERS. UNIVERSITY GRADUATES NOW MAKE A POINT OF SEEKING OUT EMPLOYERS WITH A POSITIVE CORPORATE ENVIRONMENTAL RECORD. THE AGENDAS OF ORGANIZED LABOUR ARE GREENING.

THE MYTH THAT ENVIRONMENTAL INVESTMENTS MUST BE PUT OFF IN DIFFICULT ECONOMIC TIMES IS ALSO FADING.

JAPAN AND GERMANY -- BOTH SUCCESSFUL WORLD TRADERS -- PRODUCE LESS WASTE AND CONSUME LESS IN PER CAPITA ENERGY AND WATER THAN CANADIANS.

ON THE OTHER SIDE OF THE SAME COIN, THE FAILURE TO UNDERTAKE ENVIRONMENTAL INVESTMENTS HAS ITSELF SEVERELY CRIPPLED ECONOMIC PRODUCTIVITY IN SOME OF THE NEWLY-INDUSTRIALIZED REGIONS OF EASTERN EUROPE AND THE SOVIET UNION.

AS CANADIANS ENTER A PERIOD OF MORE INTENSE WORLD COMPETITION, ENVIRONMENTAL CONSERVATION AND AN INTELLIGENT USE OF RESOURCES WILL NOT ONLY REDUCE OUR DRAW ON LAND, AIR AND WATER, BUT FORCE AN INCREASING AMOUNT OF ATTENTION ON CORPORATE ISSUES OF PROCESS AND QUALITY.

IN ESSENCE, CONSERVATION WILL BREED EFFICIENCY.

IN A MARKET ECONOMY, FIRMS THAT PRACTICE CONSERVATION IN ENERGY AND RESOURCES SHOULD SURVIVE AND PROSPER, EVEN IN TOUGH TIMES. COMPANIES THAT ARE INEFFICIENT AND CAN'T FINANCIALLY SUPPORT ENVIRONMENTALLY DRIVEN SYSTEMS WILL NOT.

IN TIMES OF ECONOMIC PROGRESS, CANADIANS HAVE COME TO RELY ON THE MYTH THAT THERE ARE ALWAYS MORE TREES ON THE NEXT HILL AND MORE LAKES IN THE NEXT VALLEY.

THERE AREN'T. ABUNDANCE BREEDS WASTE AND WASTE BREEDS INEFFICIENCY. UNTIL WE DEVELOP A "WASTE NOT, WANT NOT" MENTALITY, CANADA WILL NOT ACHIEVE ITS FULL COMPETITIVENESS IN THE WORLD.

PRACTISED AT ALL LEVELS, A CORPORATE ENVIRONMENTAL ETHIC CAN CREATE MODELS OF EFFICIENCY AND STANDARDS OF EXCELLENCE. EMPLOYEES RESPOND WITH PRIDE AND CONSUMERS VOTE WITH THEIR DOLLARS. CONSERVATION AND EFFICIENCY GO HAND IN HAND.

ENVIRONMENTAL INVESTMENT, FAR FROM BEING AN ECONOMIC BOGEYMAN, CAN BE AN INCENTIVE TO EFFICIENCY AND ECONOMIC RECOVERY.

★ ★ ★ ★

NOW, I HAVE TO TELL YOU THAT I'M A FAN OF THE TRADITIONAL SCHOOL OF THOUGHT ABOUT THOSE WHO LIVE IN GLASS HOUSES.

AT OUR OWN QUAKER OATS OPERATIONS IN PETERBOROUGH, WE'VE ATTEMPTED TO LIVE BY A NEW SET OF PRINCIPLES OF CORPORATE AND ENVIRONMENTAL RESPONSIBILITY.

WE'VE DONE OUR BEST TO TURN OUR WORDS INTO ACTION AND TO REALLY MAKE A DIFFERENCE IN EVERYTHING WE DO.

FIRST, WE HAVE A PERMANENT ENVIRONMENTAL COMMITTEE IN PLACE. ITS MEMBERSHIP IS OUR ENTIRE SENIOR MANAGEMENT TEAM.

WE HAVE A CORPORATE ENVIRONMENTAL POLICY, THE ESSENTIAL PURPOSE OF WHICH IS TO INTEGRATE ECONOMIC AND ENVIRONMENTAL DECISION-MAKING IN ALL ASPECTS OF BUSINESS PLANNING AND OPERATIONS.

WE PUBLISH AN INTERNAL UPDATE ON ENVIRONMENTAL NEWS AND RESPONSIBILITY FOR THE BENEFIT OF ALL STAFF: WE BELIEVE THAT COMPANIES SHOULD BE JUDGED BY THE PEOPLE THEY KEEP.

AT THE PLANT LEVEL, WE'VE REDUCED THE WASTE WE SEND TO LANDFILL BY 80 PER CENT SINCE 1986 -- A LEVEL WELL IN EXCESS OF THE 25 PER CENT 1992 GOAL SET BY THE PROVINCIAL GOVERNMENT.

THIS REDUCTION WAS ACCOMPLISHED THROUGH A COMBINATION OF WASTE REDUCTION, RECYCLING OF CORRUGATED CARDBOARD, AND THE REUSE OF FOOD-BASED WASTE THAT GOES TO A FIRM THAT MANUFACTURES ANIMAL FEED. THE PLANTS HAVE PURCHASED THEIR OWN BAILER FOR BAILING RECYCLED PAPER, AND COOPERATED WITH OUR HEAD OFFICE TO CONSOLIDATE ALL OUR RECYCLED MATERIALS.

AT HEAD OFFICE, WE'VE CREATED A BLUE BOX PROGRAM FOR RECYCLING NEWSPAPERS AND CORRUGATED, FINE AND COMPUTER PAPER. THE PROGRAM IS SUPPORTED BY A POSTER CAMPAIGN THROUGH THE OFFICE AND PLANTS EXPLAINING WHAT CAN AND CANNOT BE RECYCLED. WE USE 100% RECYCLED PAPER AND ENVELOPES, INCLUDING MATERIAL FOR OUR PHOTOCOPIERS, FACSIMILE MACHINES AND COMPUTERS. AS A RESULT OF THIS CAMPAIGN, OUR RECYCLING AND PAPER REDUCTION EFFORTS HAVE NOW RESULTED IN THE ELIMINATION OF 500,000 PAGES A YEAR, WITH A SAVING OF \$24,000 ANNUALLY IN PAPER COSTS. TWO-SIDED PHOTOCOPYING IS ADDING ANOTHER \$10,000 A YEAR TO OUR SAVINGS.

IN OUR CAFETERIAS, WE'VE INSTITUTED BOTTLE AND CAN RECYCLING AND ELIMINATED POLYSTYRENE FOAM CUPS IN FAVOUR OF CHINA, A DISHWASHER AND PHOSPHATE-FREE DETERGENT. INDIVIDUAL CONDIMENT PACKS OF FOOD HAVE BEEN REPLACED BY REFILLABLE BOTTLES, AND STIR STICKS HAVE BEEN REPLACED BY REUSABLE SPOONS.

IN OUR PACKAGING, WE PURCHASE PRODUCT DERIVED FROM RECYCLED WASTE MATERIAL. AND WE ARE CONVERTING TO 100 PER CENT RECYCLED FIBRE CONTENT IN ALL PAPERBOARD BOX PACKAGING.

JUST OVER A YEAR AGO, AS A MEMBER OF THE GROCERY PRODUCTS MANUFACTURERS COUNCIL, WE STARTED CONTRIBUTING OUR SHARE TO A \$45 MILLION, 5-YEAR EXPANSION OF THE ONTARIO BLUE BOX RECYCLING AND WASTE REDUCTION INITIATIVE THROUGH OMMRI: CORPORATIONS IN SUPPORT OF RECYCLING.

IN ADDITION, WE ARE INVESTIGATING THE COMPOSTING OF CAFETERIA WASTE AND GRASS CLIPPINGS, THE RECYCLING OF PRINTING CARTRIDGES, AND THE FURTHER ELIMINATION OF DISPOSABLE OFFICE SUPPLIES.

AT QUAKER, OUR ENVIRONMENTAL ETHIC HAS AFFECTED ALL OF OUR EMPLOYEES, FROM THE FACTORY FLOOR TO THE CORNER OFFICE. IN ESSENCE, WE'VE BECOME MORE EFFICIENT, MORE CONCERNED ABOUT WASTE AND BETTER CONSERVERS OF RESOURCES.

WHEN WE BEGAN OUR ODYSSEY OF ENVIRONMENTAL STEWARDSHIP IN 1986, MANY OF THE PROJECTS WE BEGAN WERE NEW, UNTRIED AND, FRANKLY, RADICAL.

TODAY, MANY OF THESE INITIATIVES HAVE BEEN ADOPTED BY OTHER COMPANIES AND THE SHARING OF IDEAS AND POSSIBILITIES HAS BECOME COMMONPLACE. WE NOW RECEIVE MANY REQUESTS FOR INFORMATION AND WE ARE GLAD TO RESPOND.

WE ARE PROUD OF OUR PIONEERING REPUTATION, OUR ENVIRONMENTAL STEWARDSHIP, AND OUR EFFORTS IN CONSERVATION AND EFFICIENCY.

AND IT MAKES BOTTOM-LINE SENSE AS WELL.

EACH YEAR, WE ESTIMATE NEW SAVINGS AS A RESULT OF OUR WASTE MANAGEMENT INITIATIVES INCLUDE: \$236,000 IN AVOIDED TIPPING FEES; \$34,000 IN HAULAGE SAVINGS; \$58,000 IN THE SALE OF RECLAIMED FOOD WASTE; AND A REMARKABLE \$648,000 THROUGH INCREASES IN PRODUCTION LINE EFFICIENCY.

OVERALL OUR TOTAL PLANT SAVINGS NOW AMOUNT TO ALMOST ONE MILLION DOLLARS. OF COURSE, THEY'RE WORTH MORE THAN THAT.

WHAT HAS HAPPENED AT QUAKER IS A MICROCOSM OF A MUCH BROADER AND SIGNIFICANT OPPORTUNITY FOR BUSINESS. FOLLOWING A DECADE CHARACTERIZED BY WASTEFULNESS AND A WIDENING GAP BETWEEN RICH AND POOR, I AM CONVINCED THAT CANADIANS ARE YEARNING FOR A REDISCOVERY OF PERSONAL VALUES AND COMMUNITY MORALITY.

IN OUR OWN SHOP, OUR EMPLOYEES RESPOND WITH PRIDE TO THE ENVIRONMENTAL CULTURE THAT IS VERY MUCH IN TUNE WITH WHAT WE ARE ALL HEARING FROM OUR CHILDREN ABOUT THE ENVIRONMENT AND ABOUT CONSERVATION.

ENVIRONMENTAL CONSCIOUSNESS AND CONSERVATION GO HAND IN HAND. A PROUD EMPLOYEE IS PRODUCTIVE AND A CONSERVATION-MINDED EMPLOYEE IS EFFICIENT. WASTE REDUCTION TRANSLATES INTO OPPORTUNITY. IF EMPLOYEES ARE COMMITTED TO THE OBJECTIVE AND IT'S PRACTISED AT ALL LEVELS, THE SAVINGS WILL TAKE CARE OF THEMSELVES.

ALL THIS IS INTENDED TO DEMONSTRATE THAT WE NEED NOT TRADE OFF STRONG BUSINESS PERFORMANCE FOR STRONG ENVIRONMENTAL CITIZENSHIP.

IN FACT, THEY ARE MUTUALLY SUPPORTIVE GUIDEPOSTS WHICH CAN DIRECT US TO AN ECONOMIC FUTURE IN WHICH THE SUSTENANCE OF OUR CONTINUED DEVELOPMENT IS GUARANTEED.

WHAT WE ARE NOW WITNESSING IS THE EMERGENCE OF A FUNDAMENTAL CHANGE IN SOCIAL VALUES.

THERE IS A STRONG AND GROWING AWARENESS THAT EVERYDAY ACTIONS MUST BE MADE TO FIND A FIT WITH A NEW ENVIRONMENTAL ETHIC.

PEOPLE ARE BEGINNING TO REFLECT WITH MORE CARE ON THE RENT WE PAY FOR OUR ROOM ON THE EARTH.

EACH OF US HAS A RESPONSIBILITY TO LISTEN TO OUR ENVIRONMENTAL ADVISERS AS CAREFULLY AS WE DO TO OUR FINANCIAL ADVISERS. I BELIEVE WE HAVE A WONDERFUL OPPORTUNITY TO PLAY OUR PART IN A NEW ORDER ECOLOGICAL ECONOMY -- LESS USE OF ENERGY AND RESOURCES, PRIDE IN PRODUCTION FOR EMPLOYEES AND CONSUMERS, COMMUNITY RESPONSIBILITY, DEDICATION TO EFFICIENCY AND EXCELLENCE, AN INTER-GENERATIONAL PERSPECTIVE, AND A SHARPENING OF THE COMPETITIVE EDGE.

THE BOTTOM LINE IS THIS: ENVIRONMENTAL PUSH DOESN'T HAVE TO COME TO ECONOMIC SHOVE. THE GREEN AND THE BLACK WILL NOT ONLY CO-EXIST IN THE EARTH DECADE OF THE 90'S, THEY'LL BE MUTUALLY SUPPORTIVE OF THE CYCLES OF MAN AND THE CYCLES OF NATURE WHICH ULTIMATELY SUPPORT US ALL.

GEARING UP FOR WASTE ELIMINATION

by
A.A. Schuldt, Director, Environmental
Control, Stelco Inc., Hamilton, Ontario

Introduction

Waste management issues continue to be popular topics for debate. Normally people are eager to participate enthusiastically in discussions. Many seem to have the perfect opinion and a solid explanation why certain things cannot be done. It is another matter entirely to take ideas and turn them into something real. It is tough to make things happen. It requires patience and tenacity to nurture ideas that are meant to bring about change.

It is also understandable that some who are in the midst of the waste management debate have a sense of frustration with a perceived lack of progress as landfilling and stockpiling of discarded goods is seen as the only thing society seems to be capable of doing. But when the issue is viewed from the outside by stepping back, one can see a lot of changes. There are examples of progress and pride in having reduced or even eliminated a waste problem entirely.

At Stelco waste management is an ongoing activity and recycling is a traditional reference point but when we examined our programs and judged them to ensure they continue to fit with our objectives and societal trends, we realized that we could benefit from a paradigmatic shift in our approach. What became apparent was that we wanted a new model, a new way of thinking to achieve constant and never ending improvements. The idea was to further raise the awareness level and commitment throughout the organization and thus enhance the work which was already being done. The plan is to improve waste management efforts by:

- Developing long term goals and create a vision
- Developing an organizational structure and establish visibility
- Prioritize the activities and provide focus

Vision

The initial step was to develop a vision statement which would capture and articulate the long term objectives of the organization. This meant creating a futuristic looking roadmap of principles which would serve as a common reference point. Most importantly, it also meant that the vision has to have the support of the organization. We therefore embarked on a development process which ensured the widest possible input and participation of people within the organization. The process resulted in a collection of principles which are identified now as Stelco's Health, Safety and Environmental Vision. The statement was released internally and publicly by the Chief Executive Officer in 1990. Among others, included are principles which deal with resource management and waste minimization.

The Stelco Vision is recognized as a long term commitment which requires continual improvement to practices as new understandings occur in health, safety and in environmental sciences and as advances are made in technology. Through this forward-looking approach a long standing corporate commitment toward waste management issues was further strengthened and a start was made in working toward this vision by:

- Making sustainable use of renewable natural resources, conserving non-renewable natural resources through efficient use and careful planning, and continuing to recycle products after use for the production of new steel.
- Minimizing the creation of waste and maximizing the reuse and recycling of materials. Disposing of all wastes will continue to be done through methods known to be safe and responsible.

Organization

Without an organizational structure action is not likely to happen. Ideas more likely flourish within a structure which provides an identity to which people can relate. It also establishes ownership and clarifies responsibility. A formal structure builds communication lines which are essential for making things happen.

On the premise that the impetus and policy direction comes from the "top of the house" and the implementation comes from bottom, it is important that all parts of the organization get involved. Therefore, an organization was developed for a senior management committee to direct a resource recovery and waste minimization program, set objectives and review progress. **Figure 1.** This arrangement spreads responsibility for action across a broad base of the operation. More importantly, it involves people at all levels of the Stelco operation. Regular monthly meetings and setting of targets ensure momentum is maintained. As well, we thought it advisable and necessary to have a strong research and development presence. A new section within the Research and Development Department was formed to specifically focus on resource recovery and waste reduction and together with the Environmental Control Department it provides the glue which holds the activities together.

Focus

The axiom "Whenever something is to be started, something else has to be done first" applies to waste management issues. It normally means, inventory data is insufficient, waste characteristics are incomplete, technology is inadequate or cannot be economically justified. Seemingly good ideas are lingering and are gathering dust while steps have to be taken to define the fuzzy problems and gather the required facts.

A program requires a focus and objectives and we are in the midst of reviewing a corporate plan for resource management and waste reduction. The strategy is to find ways to reduce the various types of waste we produce, either by elimination the generation of it, by reusing it within our own facilities, or by reprocessing what is now considered "waste" into a useable form or material for some other industry. The ultimate goal is to have zero "waste" shipments from each plant. This is an ambitious plan but it is essential to our future success that we maintain a clean environment, ensure that all materials are utilized effectively, and use these resources to reduce cost.

This strategy is perhaps be explained by an excerpt from a recent speech given by Stelco Steel President R. J. Milbourne, entitled "Steel Industry Competitiveness and the Environment: An Integrated Approach".

The diversity of inputs into a steel plant is staggering, including not only the basic ore and coal, or scrap, as the case may be, but all of the chemicals, lubricants, packaging materials, refractories, fluxes, reagents, and so forth. The "environmentally acceptable" method for this diversity of materials to leave the premises is either: as or in a steel product which can ultimately be returned itself, as an inert by-product such as slag which can be beneficially utilized by some other producer, or as non-objectionable emissions.

The balance, the solid and liquid waste streams, have traditionally been "disposed of" as, or in, landfill, or by expensive ex-plant secondary treatment, or accumulated on site.

As the expense, unacceptability and impracticability of these latter approaches has become evident, I believed our efforts must be redirected towards finding solutions inside the gates of the steelworks. These approaches must be of a reduction and reuse nature, so as to offset the need for, and expenditure on, new resources. A simple example is used refractories - the lime, magnesia, silica and alumina values can be applied in the blast furnace, or in the steelmaking process, as slag formers, offsetting the need for quarrying, preparing, transporting and inventorying some portion of our flux requirements. The reuse and recovery of the energy components of hydrocarbons or combustible materials is similarly available.

The real challenges lie with the toxic and exotic materials that, once in our systems, tend to, by today's standards, contaminate large volumes of otherwise benign and inert materials. The challenge here is to learn to live without these materials, to keep them off our premises altogether, or to find simple and cost-effective ways to concentrate them into feedstock saleable to some other user.

In this regard we are:

- Updating secondary material inventories, material balances and generation rates
- Assessing secondary material management costs
- Prioritizing action on the basis of cost, volume and ease of implementation
- Setting of measurable objectives looking for cost savings, volume reduction
- Monitoring process and technology changes
- Developing an implementation plan

So far we have:

- Identified that liquid wastes afford opportunities for immediate savings
- Identified methods for recovering iron and carbon units from stockpiled secondary materials which would result in reduced raw material purchases
- Identified existing facilities which have the potential to treat or consume waste
- Identified areas where research and pilot studies are needed to confirm that reuse and recycle options are technically feasible and economically viable
- Asked for specific proposals for service contracts for processing selected secondary raw material for recycling
- Upgrade an existing facility in preparation to reuse partly spent caustic and acidic liquids

The work presently underway is evolving into a new corporate plan for resource management and waste reduction. The idea is to build on the past successes and start focusing on a zero waste objective in the business of making steel. We are underway to recast the mold. The trick to stay competitive is to do what you do smarter and better.

Recovery and Reuse

The measures we are taking now are aimed at positioning the organization to deal with the waste issues effectively in the 90's and beyond.

Stelco has been practising all along resource conservation and here are a few examples:

Scrap

Most people are familiar with the fate of worn out automobiles. The hulks are collected, flattened, shredded, remelted and made into new products. Steel cans follow essentially the same circuit. It has been noted that for every ton of steel which is recycled, 1.5 tons of iron ore and 3.6 barrels of oil are saved. The ability to use scrap in making new steel is an important element in getting rid of unwanted materials that would otherwise fill up landfill sites and Stelco serves as an end point of the cycle. Two of Stelco's steelmaking plants use 100% steel scrap for producing new steel products at the facilities in Alberta and Quebec. Our plants in Ontario use scrap as well.

Slag

On the other side, steel production generates by-products for which uses have to be found. Blast furnace slag for instance. Blast furnace slag is a by-product of the blast furnace operation. It is a remarkable material which has been used extensively in construction of roads, asphalt road surfaces and buildings. Recent developments by National Slag have created a new product known as pelletized slag. This value added product increased the opportunities to recycle blast furnace slag. A pelletizing machine was recently installed on one of our blast furnaces to produce this type of slag. Over 450,500 tonnes were used for these purposes in 1988.

Tar Pitch Recovery

Tar pitch is a by-product of coke making and is recovered as a granular, sticky solid material containing coke fines and tar-like substances. The material is difficult to handle but a system has been developed to mix the tar pitch with coal and return it to the coke ovens as a feed material. A system has been recently installed which allows us to recycle all of the materials generated which previously had to be landfilled. At the Lake Erie Works facility alone about 2000 tonnes of tar pitch are recovered at a cost saving of about \$450,000. The program has been extended to look after materials generated at the Hamilton Plant and thus we have already achieved a zero waste position for this vexing problem through practice changes.

Iron Oxide

Some of the iron oxides which are collected by environmental control systems can be recycled to recover iron. This is achieved first, by making a hard agglomerate from fines in a Sinter Plant and then charging the material to a blast furnace for smelting and iron recovery.

This technology gives Stelco the opportunity to recycle fine materials recovered in air cleaning devices such as dust catchers, electrostatic precipitators, baghouses and water scrubbers. Fine material from the ore handling is recycled in this fashion as well. Approximately 570,000 tonnes of material is recovered through this facility each year.

The Stelco facility operates already on a higher level of recovery of secondary raw materials or reverts more than any other plant in North America. Our objective is to get to a 100% recycle use level.

Oil Recovery Plant

Some years ago, we installed a novel water treatment plant for handling spent lubricating oils from our cold rolling operations. A chemical process is used to break oil in water emulsions before the oil can be removed from water. Instead of using high quality fresh chemicals for emulsion breaking, we postulated that spent acids and alkali liquids from other operations would perform just as well provided the quality remains fairly constant. This approach would permit us to reduce waste volume through direct reuse.

In addition, the plant is equipped with a neutralization system and has a vacuum filter to remove solids. With some modifications it is possible to make greater use of this feature and use it as a method to reduce waste volume by producing a dry filter cake for landfilling.

Preliminary tests have confirmed the ideas are feasible and steps have been taken to upgrade the oil recovery plant. This work is nearly complete and later this year we would then be in a position to resume more detailed testing.

Oils which are recovered in the Pori Plant may be used as a fuel oil or as a dust control agent. All of the oil we use for dust control on coal fields is completely recovered when coal is converted in coke ovens.

About 2.5 million litres of spent oils have been recovered in 1989 and we have started to examine ways to use the facility for reusing other chemicals.

Water Conservation

In an integrated steel plant large quantities of water are vital to protect equipment from the extreme temperatures necessary to produce steel. Water is also used to clean the steel surface and flush rolling scale into collecting scale pits and the like. Although in traditionally basic steel plants cooling water is usually cascaded for reuse for other purposes and a certain amount of recycle has always existed, older plants still require between 90 and 175 cubic metres of water for each tonne of steel produced.

In the case of the newest basic steel plant which was built in the 70's by Stelco near the village of Nanticoke on the shores of Lake Erie, advanced concepts of water recycle and reuse was included. Both process water and clean cooling water are recycled. As a result a greater than 90 percent reduction in water discharge has been achieved. In comparison the discharge is approximately 7.8 cubic metres per tonne of steel produced.

It should be noted that this high degree of recycle carries with it a penalty in terms of energy usage since additional pumping steps are required for recycle and to pass the water over cooling towers.

Stelco was the first Canadian steel producer who changed the water systems for blast furnace gas cleaning to a recirculation system to reduce the discharge of water pollutants and reduce water flow.

Similarly, ion exchange facilities have been installed to convert once-through water rinsing operations to 100% recycle. This process change has resulted in a zero discharge situation and is ahead of the times.

Other examples exist where measurable progress has been achieved and now we want to be even better.

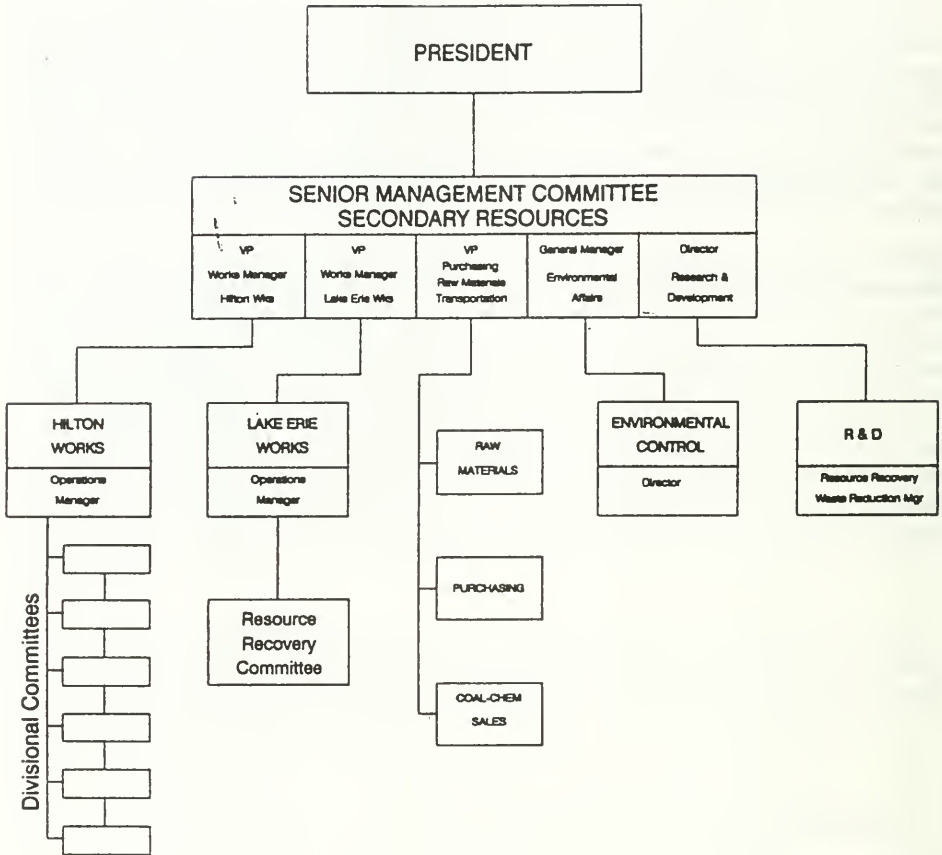
Conclusion

As one commentator said recently, "Before the 20th century has run its course, everyone will be an environmentalist". The increase in environmental awareness has been incredible and has given a visible boost to promoting sound management practices. However, for resource recovery and waste reduction to occur in a substantive way, organization commitment is needed. Resource recovery and waste reduction should involve the entire organizational structure. A broad base of people and a belief that alternatives can be found are the essential elements which make things happen. Legislation alone is not enough. It is perhaps a necessary instrument through which change may be initiated, however, a lot has already been accomplished voluntarily, for cost reduction is a powerful incentive.

Stelco is a complex and integrated steel producer and a recycler of large amounts of water, acids, scrap metal, oil and other material but the challenge for the 90's is to get even better. The issue is how to achieve more quickly waste reductions, first of all, through process modifications and secondly by viewing every waste as a valuable resource which provides an opportunity to reduce the need to purchase new raw materials. We will continue to use scrap steel in our operations to produce new steel products, and thus serve as a consumer of otherwise unwanted materials, while at the same time we will continue to study our own operation to further reduce the generation of waste.

The new attitude for the 90's is to think in terms of resources instead of waste and turn materials into products for sale.

Figure 1



Resource Management Organization at STELCO

HEALTH, SAFETY AND ENVIRONMENTAL VISION

The health and safety of our employees and protection of the environment are THE top priorities at Stelco. We are committed to continued leadership and excellence in the health and safety of employees and in protecting and enhancing the environments of the communities where we have operating facilities.

We will continue to manage our business in a manner that leaves employees and our communities healthy and safe while producing quality products for our customers. We recognize this is a long term commitment which requires continual improvement to our practices as new understandings occur in health, safety and in environmental science, and as advances are made in technology.

We will work toward this vision by:

- ☐ *Employing safe technologies and operating procedures and by being prepared for emergencies including cooperation with government and other businesses where community action is needed.*
- ☐ *Developing internally or seeking out on a world-wide basis, the best available technology which is health, safety and environmentally compatible.*
- ☐ *Minimizing and striving to eliminate the release of substances that adversely affect the work environment or cause damage to the natural environment.*
- ☐ *Committing management resources, including a Health, Safety and Environment Committee of the Board of Directors, to ensure the implementation of our policies and procedures, and compliance with regulatory requirements.*
- ☐ *Conducting regular self-evaluations of health, safety and environmental performance at each facility. Risk evaluation techniques will be employed to prevent environmental incidents.*
- ☐ *Maintaining a system of pre-evaluation of capital appropriations to ensure compatibility with our Health, Safety and Environmental policies and procedures.*
- ☐ *Requiring all our people to share the responsibility of reporting and improving upon conditions that pose health and safety risks or threaten the environment.*
- ☐ *Continually improving the education of our people in health, safety and environmental matters including joint programs with the Unions at our manufacturing sites.*
- ☐ *Making sustainable use of renewable natural resources, conserving non-renewable natural resources through efficient use and careful planning, and continuing to recycle products after use for the production of new steel.*
- ☐ *Minimizing the creation of waste and maximizing the reuse and recycling of materials. Disposing of all wastes will continue to be done through methods known to be safe and responsible.*
- ☐ *Investing in improved energy efficiency and conservation in our operations and making every effort to use environmentally safe and sustainable energy sources to meet our needs.*

In addition to protecting the health and safety of our employees and the environments of the communities where we have operating facilities, we believe that adherence to these principles will sustain the viability of our business, and enable us to continue to provide value to our employees, communities, customers and shareholders.



INTEGRATED WASTE MANAGEMENT
- AN ACHIEVABLE SOLUTION

by
P. Douglas Sirrs, Environmental
Engineer, General Motors of Canada
Limited, Oshawa, Ontario

Waste Management at the General Motors Autoplex facility in Oshawa has followed an evolutionary path over the past few years. While the complex, due to its size, can be compared to a small city, its Waste Management System has evolved into a self-contained integrated system. The only externally operated component being Brock Road Landfill in Pickering.

The dominant influence on the system is the recognition of the inter-dependence of the different components and their affect, within the system, on each other.

The following is a brief overview of the G.M. Autoplex Facility:

- . Site area = 522 acres
- . Building area = 8 million sq. ft.
- . Plants
 - Truck Plant
 - 2 Car Plants
 - Battery Plant
 - Radiator Plant
 - Rear Axle Plant
 - Building Construction Shops
- . Production Rate = approx. 2400 vehicles/day
(total) (2 shifts)
- . Products
 - Light Duty Extended Cab Trucks
 - Chevrolet Lumina
 - Buick Regal
 - Batteries
 - Radiators
 - Rear Axle assemblies
 - Building Construction Shops

The following is a brief outline of Waste Streams and Programs on-site:

- 1) Container Design for Recyclability
 - 2) Returnable Container programs
 - 3) Returnable Drum programs
 - 4) Recycled

- Cardboard	750
- Fine Paper	30
- Newspaper	15
- Pop Cans	1
- Drywall	-
- Clean Fill	-
- Concrete/Brick/Rubble	-
- Steel	440
 - 5) Energy From Waste 750
 - 6) Landfill 1100
- (* all values in tonnes/month) approx. 3100

It should be noted that the numbers already reflect reductions made over the past couple years. In April 1991, G.M., Oshawa received an Award of Merit from the Region of Durham in recognition of its landfill diversion efforts (36% reduction between 1988 and 1990).

The main pressures that have been influencing the evolutionary change in the Waste Management System at G.M., Oshawa are:

- 1) Landfill
 - capacity
 - costs
 - material bans
- 2) National Packaging Protocol
- 3) Heightened Environmental Awareness and concern in the
 - Public
 - Government
 - Industry

Within the management of the system is the consideration of the 4 R's:

Reduce
Reuse
Recycle
Recover

They provide the guidance to set the priorities and direction when evaluating future initiatives.

As a result of these pressures and G.M.'s own commitment to continuous improvement, the system is comprised of the following components:

- 1) Collection systems/lineside segregation
- 2) Returnable container programs
- 3) Recycling programs
- 4) Waste Sorting Facility
- 5) Energy From Waste Facility
- 6) Landfill (externally controlled)

In the process of co-ordinating the activities of the different components of the system the basic "Operating Philosophy" came into focus.

All components of the Waste Management System are inter-related and dependent on each other. Each component is operated in conjunction with the others in order to maximize the system as a whole".

The importance of this statement is to not isolate and focus on any single component in the system but to consider all the other programs and facilities as integral ingredients in the operation of the component in question.

Collection programs are not necessarily revolutionary, but the co-ordination of them is critical to the success the other components in the system because they are the "Cornerstones" for all the other programs and facilities.

Returnable container programs are important since they avoid the generation of waste to begin with. The major influences on these programs are economics and Material handling. In certain cases though, it is important to realize that it is not economically feasible to use returnable containers. In these situations, features can be designed into the package to aid in the recycling process of the expendable containers:

- i.e. - cardboard pallets
- cardboard corner supports (vs. wood)
- molded paper dunnage (vs. foam)

Recycling programs have greatly increased in recent years as a result of increased landfill costs and material bans. Expansion of these activities will continue in the future, but it is very important to ensure that market forces play a large role in these initiatives.

After providing the collection and recycling programs in the Plants, there is still a large portion of waste materials that can not be easily segregated at lineside. This portion of the waste stream is collected and processed at the on-site "Waste Sorting Facility". This facility processes the non-segregated, mixed plant waste using the following processes:

- 1) Tipping floor
- 2) Shaker Screen Unit
- 3) Conveyors
- 4) Hand Picking (labour)
- 5) Magnetic Separation
- 6) Compactors

The resulting processed materials are:

- 1) Cardboard
- 2) Wood
- 3) Metals
- 4) Burnable Residues
- 5) Landfill
- 6) Shaker Dirt

This facility is operated by a contractor who provides services for sorting, movements and reporting, as well as, equipment and manpower.

After reducing incoming quantities of packaging, reusing containers and recycling where economically viable, burnable residues are processed at the on-site Energy From Waste Facility (EFW). This facility recovers the energy value and reduces the volume of waste prior to landfill disposal.

The EFW is a Rotary Kiln, two stage combustion process with pre-shredding. The sorted burnable residues from the Waste Sorting Facility are shredded to a 3" - 4" nominal size using a "Pit and Crane" process. The following is a brief overview of the processes within the EFW:

- 1) Shredder - low (20) rpm shear shredder
- 350 Hp
- 2) Rotary Kiln - primary combustion
- 1500 deg. F at 20 minute retention
- 3) Secondary Combustion Chamber
- 2000 deg. F at 1 second retention (gas)

- 4) Boiler - 30,000 lbs. steam/hour

Note: - total powerhouse = 150,000 lbs/hr (summer)
= 500,000 lbs/hr (winter)

- 5) Cyclone - fly ash removal
6) Baghouses - fly ash removal
7) Continuous Emissions Monitoring:
- HCL
- CO, O₂
- SO₂, NO_x
- total Hydrocarbon
- opacity

The significant operational factors that affect and result in a successful system are:

- 1) single contractor (long term contract)
- 2) monitoring and reporting
- 3) full time GM liaison with Plants/Contractor
- 4) increased visibility of programs.

The most important of these is the Monitoring and Reporting. Significant increases in the detail of information monitored is required to manage the inter-dependent nature of the system.

Future initiatives include continuation and expansion of the existing programs (packaging reduction and design, returnable containers and drums, and recycling). The major focus at this stage is to increase lineside segregation through improved collection and handling programs. The area that will positively impact on lineside segregation is packaging design. These initiatives should provide for improved cost and handling efficiencies.

Finally, it is important to emphasize that in dealing with Waste Management issues there are many options available today. Each has a place in complementing and enhancing the overall system by working within an integrated framework.

POLYSTYRENE RECYCLING:
MAKING IT HAPPEN

by
Michael G. Scott, President,
Canadian Polystyrene Recycling
Association, Toronto, Ontario

I FIRST OF ALL WANT TO THANK YOU FOR THE OPPORTUNITY TO PARTICIPATE IN THIS YEAR'S WASTE MANAGEMENT CONFERENCE, AND THIS AFTERNOON'S DISCUSSION.

I HAVE BEEN ASKED TO TALK TO YOU ABOUT HOW THE POLYSTYRENE INDUSTRY IS MAKING THE RECYCLING OF ITS PRODUCT A REALITY. I DON'T THINK I NEED TO SPEND MUCH TIME EXPLAINING WHY THE INDUSTRY MUST ACHIEVE THIS OBJECTIVE. THE REASON IS QUITE CLEAR.

POLYSTYRENE IS NOT PARTICULARLY AT THE TOP OF THE ENVIRONMENTAL POPULARITY CONTEST. IN FACT, ITS PROBABLY VERY NEAR OR AT THE BOTTOM. IT IS PERCEIVED BY MANY TO BE THE MOST PROMINENT SYMBOL OF OUR THROWAWAY HABITS. IT IS REGARDED AS BEING ENVIRONMENTALLY UNFRIENDLY - THAT IS, MANY PEOPLE BELIEVE IT CANNOT BE RECYCLED, IS A MAJOR CONTRIBUTOR TO OZONE DEPLETION AND CONSUMES A LOT OF RAW MATERIAL AND ENERGY IN ITS PRODUCTION.

THESE PERCEPTIONS PROBABLY REACHED THEIR CLIMAX WHEN MCDONALD'S ANNOUNCED LAST NOVEMBER - ONE MONTH AFTER I JOINED THE CANADIAN POLYSTYRENE RECYCLING ASSOCIATION - THAT THEY WERE NO LONGER GOING TO USE POLYSTYRENE FOODSERVICE CONTAINERS IN THEIR RESTAURANTS. THE DECISION WAS WIDELY APPLAUDED, BY THOSE WHO FELT IT WAS TIME THE DEED WAS DONE TO POLYSTYRENE.

IN MANY WAYS, THAT ANNOUNCEMENT HAS HELPED TO FOCUS MORE PUBLIC ATTENTION ON THE IMPORTANT ENVIRONMENTAL FACTS INVOLVED IN THIS ISSUE - NAMELY, THAT INDEPENDENT RESEARCH PUBLISHED OVER RECENT MONTHS DEMONSTRATES THAT IT IS, IN FACT, ENVIRONMENTALLY FRIENDLY; THAT, UNLIKE MANY FOODSERVICE CONTAINERS, IT IS AND CAN BE RECYCLED; AND, FINALLY, THAT MOST CANADIAN POLYSTYRENE FOODSERVICE PRODUCERS NEVER USED CFC'S IN THE FIRST PLACE AND THOSE WHO DID ELIMINATED THEIR USE IN 1988.

HOWEVER, I AM NOT HERE THIS AFTERNOON TO DISCUSS THOSE ISSUES IN DETAIL, MUCH AS I'D LIKE TO. INSTEAD, I AM HERE TO TELL YOU HOW THE CANADIAN POLYSTYRENE RECYCLING ASSOCIATION (CPRA) IS GETTING ON WITH THE TASK OF ESTABLISHING VIABLE POLYSTYRENE CAPABILITY, AS QUICKLY AS IT CAN.

I WANT TO DO THIS BY DESCRIBING THE RECYCLING PROGRAM WE HAVE PUT TOGETHER, WHICH INCLUDES CANADA'S FIRST FULL-SERVICE POLYSTYRENE RECYCLING FACILITY, NOW CONSTRUCTED AND ABOUT TO GO INTO OPERATIONS IN MISSISSAUGA ONTARIO. I ALSO WANT TO TALK ABOUT THE BIGGEST CHALLENGE WE FACE - COLLECTING AND RECYCLING POLYSTYRENE FROM FOODSERVICE OUTLETS.

LET ME BEGIN WITH A BRIEF DESCRIPTION OF WHO WE ARE. CPRA WAS FOUNDED IN 1989, AS A NON-PROFIT, NON-SHARE CORPORATION. AT THAT TIME, THE POLYSTYRENE RAW MATERIAL SUPPLIERS, MANUFACTURERS AND END-USERS REALIZED THAT A MAJOR RECYCLING INITIATIVE WAS REQUIRED, IF THEIR PRODUCT WAS TO SURVIVE.

THE MEMBERS OF CPRA ARE A DIVERSE GROUP, OPERATING IN A HIGHLY COMPETITIVE INDUSTRY. THEY COMPRISE RAW MATERIAL SUPPLIERS SUCH AS DOW CHEMICAL, NOVACOR AND SHELL, MANUFACTURERS OF POLYSTYRENE PRODUCTS SUCH AS CANADA CUP, LILY CUP, DART CUP, FIBRACAN, PORTION PACKAGING AND POLAR PLASTIC, DISTRIBUTION COMPANIES SUCH AS PRICE DAXION AND ADELCO SUPPLY, AND END-USERS SUCH AS DAIRY QUEEN, VS SERVICES, AIR CANADA, AND, YES, MCDONALD'S RESTAURANTS OF CANADA.

CPRA'S GOALS BOIL DOWN TO THREE VERY SIMPLE BUT FUNDAMENTAL STATEMENTS: FIRST, TO DEMONSTRATE THAT POLYSTYRENE CAN AND IS BEING RECYCLED, IN AN ENVIRONMENTALLY ACCEPTABLE MANNER. AS AN ASSOCIATION, I BELIEVE THIS MAKES CPRA DISTINCT FROM MANY OTHER INDUSTRIAL ASSOCIATIONS, IN THAT IT IS COMMITTED TO ESTABLISHING AND OPERATING ACTUAL RECYCLING FACILITIES, RATHER THAN SIMPLE TALKING ABOUT THE NEED TO DO SO. MANY MANUFACTURERS ARE EMBRACING THE RECYCLABILITY LABEL, BUT HOW MANY OF THEM ARE WORKING TO PUT VIABLE RECYCLING SYSTEMS IN PLACE?

ITS SECOND GOAL IS TO TALK TO THE PUBLIC ABOUT THE RECYCLABILITY OF POLYSTYRENE. SIMPLE PUT, THE VAST MAJORITY OF CANADIANS DO NOT BELIEVE POLYSTYRENE IS AND CAN BE RECYCLED. WE HAVE A HUGE JOB TO DO IN DEMONSTRATING THAT THIS IS THE CASE, AND THAT POLYSTYRENE IS, IN FACT, ENVIRONMENTALLY FRIENDLY.

FINALLY, CPRA NEEDS TO ENCOURAGE THE PUBLIC TO JOIN WITH IT IN PARTICIPATING IN A RECYCLING PROGRAM. WE SIMPLE CANNOT AND WILL NOT BE ABLE TO RECYCLE POLYSTYRENE UNLESS WE GET ACTIVE PARTICIPATION FROM THE END-USERS THEMSELVES.

BEFORE LOOKING AT THIS PROGRAM I THINK IT WOULD HELP IF I GAVE YOU A QUICK SUMMARY OF THE POLYSTYRENE INDUSTRY, IN TERMS OF THE AMOUNT OF POLYSTYRENE USED IN CANADA, AND WHERE THIS USAGE OCCURS.

APPROXIMATELY 200,000 TONNES OF POLYSTYRENE ARE USED IN CANADA EACH YEAR, OF WHICH ABOUT 35,000 TONNES ARE IMPORTED.

ALMOST HALF OF THIS TOTAL AMOUNT IS USED FOR PROTECTIVE PACKAGING AND GROCERY PACKAGING. THIS IS THE MATERIAL THAT YOU FIND ENCLOSED IN COMPUTERS, TELEVISION SETS, ELECTRONIC EQUIPMENT, AUTOMOBILE PARTS AND GROCERY

PRODUCTS. THESE PACKAGING MATERIALS WILL FORM THE LARGEST VOLUME OF FEEDSTOCK MATERIAL COMING INTO OUR RECYCLING FACILITIES, AND ARE THE MOST ECONOMICAL AND EASY TO RECYCLE. AT THE PRESENT, MOST ARE GOING DIRECTLY TO LANDFILL.

ABOUT 25% OF CANADIAN POLYSTYRENE IS USED IN THE FOODSERVICE INDUSTRY, AND ONLY A SMALL PERCENTAGE OF THAT AMOUNT IS IN THE FORM OF THE FOAM CUP, THE MOST VISIBLE AND WIDELY USED PRODUCT PRODUCED BY THE POLYSTYRENE INDUSTRY. ALMOST A THIRD IS USED AS A DURABLE PRODUCT, WHICH DOES COME OUT OF USE AND IS NOT AVAILABLE FOR RECYCLING.

IN TERMS OF GEOGRAPHIC DISTRIBUTION, POLYSTYRENE USAGE FOLLOWS THE EXISTING CANADIAN PATTERNS IN TERMS OF INDUSTRIAL ACTIVITY. THIS MEANS THAT THE MAJORITY OF POLYSTYRENE USAGE OCCURS IN ONTARIO, QUEBEC AND BRITISH COLUMBIA, WITH SMALLER AMOUNTS IN USE IN THE MARITIME AND WESTERN PROVINCES.

LOOKING AT OUR LARGE URBAN AREAS, WE HAVE ESTIMATED THAT APPROXIMATELY 32,000 TONNES OF POLYSTYRENE IS AVAILABLE FOR RECYCLING IN THE GREATER TORONTO AREA, STRETCHING DOWN TO HAMILTON AND EAST TO OSHAWA. IN MONTREAL AND VANCOUVER, WE ARE ESTIMATING APPROXIMATELY 23,000 TONNES AND 11,000 TONNES RESPECTIVELY.

I THINK IT IS WORTH NOTING HERE THAT POLYSTYRENE IS NOT A MAJOR CONTRIBUTOR TO LANDFILL COMPOSITION. IN FACT, IT CONTRIBUTES LESS THAN 1% BY WEIGHT AND BY VOLUME TO LANDFILL COMPOSITION, BASED ON RESEARCH DONE ON LANDFILL CONTENTS IN BOTH UNITED STATES AND CANADA. THIS IS NOT TO SAY THAT POLYSTYRENE SHOULD NOT BE ON THE RECYCLING AGENDA. BUT IF WE ARE TO MAKE A MAJOR IMPACT ON REDUCING OUR WASTESTREAMS, WE CAN ONLY ACHIEVE THIS BY FINDING WAYS TO REDUCE AND REUSE THE MAJOR COMPONENTS - NAMELY, PAPER AND PAPERBOARD PRODUCTS, AND FOOD AND YARD WASTE.

I WOULD NOW LIKE TO TURN TO THE RECYCLING PROCESS WHICH WE HAVE DEVELOPED AND TAKE YOU THROUGH ITS CRITICAL STEPS. THERE IS REALLY NOTHING MAGICAL ABOUT THIS, AS ANY RECYCLER KNOWS. LIKE OTHERS, OUR BIGGEST CHALLENGE LIES IN THE COLLECTION AND SORTATION PROCESS, WHICH I WANT TO TALK ABOUT IN A BIT MORE DETAIL.

LOOKING AT THE RAW MATERIAL SOURCES, OUR MARKET RESEARCH ANALYSIS OF POLYSTYRENE USED IN BOTH THE PRIVATE AND PUBLIC FOODSERVICE SECTOR, AND THE NON-FOOD INDUSTRIAL COMMERCIAL PACKAGING SECTOR, HAS GIVEN US A REASONABLE HANDLE ON THE VOLUMES OF MATERIAL WE BELIEVE ARE AVAILABLE FOR RECYCLING. AS I MENTIONED EARLIER, IN THE GREATER TORONTO AREA ALONE, WE ARE ESTIMATING THAT 32,000 TONNES OF BOTH POST-CONSUMER AND POST-INDUSTRIAL POLYSTYRENE ARE AVAILABLE FOR RECAPTURE AND RECYCLING.

THE ESTABLISHMENT OF AN EFFECTIVE COLLECTION PROCESS FOR FOODSERVICE POLYSTYRENE HAS BEEN THE MOST CHALLENGING AND COMPLEX PART OF THE PROGRAM. OUR PILOT STUDIES HAVE FOCUSED ON THE PROVISION OF EFFECTIVE EDUCATIONAL AND INFORMATION MATERIALS, THE DEVELOPMENT OF AUDIT PROGRAMS USED TO MONITOR RESULTS, THE DEVELOPMENT OF EQUIPMENT AND SUPPLIES WHICH FACILITATE THE SEPARATION AND COLLECTION OF POLYSTYRENE IN RESTAURANTS, AND, FINALLY, THE COORDINATION OF TRANSPORTATION SERVICES TO SORTATION AND PROCESSING FACILITIES.

IN 1990 WE CONDUCTED SEVERAL PILOT PROJECTS IN ONTARIO AND QUEBEC FOODSERVICE LOCATIONS, WHICH INCLUDED THREE FAST FOOD RESTAURANTS, TWO INDUSTRIAL CAFETERIAS AND ONE SHOPPING MALL. SINCE THEN WE HAVE EXPANDED THE PROGRAM TO INCLUDE A FOOD COURT MALL AND SEVERAL ADDITIONAL FOODSERVICE ESTABLISHMENTS. AT THE HEIGHT OF THE PROGRAM LAST YEAR, WE HAD OVER 60 FOODSERVICE ESTABLISHMENTS ON A COLLECTION PROGRAM.

THIS HAS TAUGHT US A LOT ABOUT THE MOST EFFECTIVE WAY TO COLLECT THIS MATERIAL AT SOURCE. IT IS A DELICATE PROCESS, WHICH RELIES HEAVILY ON EFFECTIVE COMMUNICATION, CLEAR SIGNAGE, ADVANCE PUBLICITY AND STAFF TRAINING. IN FACT, WE FOUND OUR RECAPTURE AND CONTAMINATION RATES IMPROVED SIGNIFICANTLY, ONCE WE HAD MADE ADJUSTMENTS TO THE

SIGNAGE, AND OUR TRAINING PROGRAM. WE HAVE USED MANY VERSIONS OF SIGNS, FROM VERY SIMPLE AND TWO-COLOUR DISPLAYS, TO MULTI-COLOURED, HIGHLY VISIBLE SIGNS USED IN OUR FOOD COURT MALL PROGRAM.

I CAN'T EMPHASIZE ENOUGH HOW IMPORTANT THESE TOOLS ARE, IF A PROGRAM OF THIS NATURE IS TO WORK PROPERLY. WHILE MOST OF US HAVE LEARNED THROUGH THE BLUE BOX HOW TO SEPARATE OUR GARBAGE IN THE PRIVACY OF OUR OWN HOMES, WE MAY NOT BE QUITE AS WILLING, OR EFFECTIVE IN DOING SO, IN PUBLIC PLACES. OUR RESEARCH TELLS US THAT THE PUBLIC WILL SPEND APPROXIMATELY FOUR SECONDS ONLY SEPARATING THEIR GARBAGE IN A FOODSERVICE RESTAURANT BEFORE THEY EITHER GIVE UP, BECOME CONFUSED, OR EMBARRASSED, OR BOTH, AND DEPOSIT THE MATERIAL IN THE FIRST AVAILABLE RECEPTACLE.

WE HAVE SET SOME VERY AMBITIOUS TARGETS THIS YEAR FOR THE COLLECTION OF THIS TYPE OF POLYSTYRENE. WE HOPE TO COLLECT APPROXIMATELY 700 TONNES, AND BRING IT INTO THE MISSISSAUGA FACILITY FOR RECYCLING BEFORE THE END OF THE YEAR. WE WILL BE DOING THIS IN INDUSTRIAL AND SCHOOL CAFETERIAS, MAJOR FOOD COURTS, AND FAST FOOD OPERATIONS. WE ALSO HOPE TO EXPAND THE PROGRAM INTO RECREATIONAL FACILITIES, MAJOR EDUCATIONAL INSTITUTIONS AND GOVERNMENT OFFICE BUILDINGS. OUR CHALLENGE WILL BE TO BRING ALL OF THESE LOCATIONS ON STREAM IN AN ORDERLY, EFFECTIVE WAY.

ONE OF THE KEYS TO THE ENTIRE PROCESS IS THE SORTATION CAPABILITY, WHICH, FRANKLY, IS THE MOST TIME CONSUMING, COSTLY AND UNPLEASANT PART OF THE PROCESS. EVEN THOUGH WE EXPECT TO ACHIEVE REASONABLY LOW CONTAMINATION LEVELS IN THE AT-SOURCE COLLECTION STEP OF THE PROCESS, MANUAL SORTATION WILL STILL BE REQUIRED PRIOR TO ACTUAL PROCESSING. RATHER THAN PLACE THE FULL BURDEN OF THIS PROCESS ON THE RECYCLING PLANTS ITSELF, WE ARE LOOKING TO REDUCE CONTAMINATION TO MANAGEABLE LEVELS THROUGH SOURCE SEPARATION AND SATELLITE SORTATION, PRIOR TO ARRIVAL AT THE FACILITY. WE ARE ALSO LOOKING AT HOW THIS PROCESS MUST BE REGIONALIZED ACROSS THE PROVINCE. HOWEVER, WE FACE THE SAME PROBLEM OTHER MAJOR RECYCLERS ARE PLAGUED WITH - A HIGHLY EXPENSIVE, LABOUR INTENSIVE PROCESS.

TURNING TO THE RECYCLING PROCESS ITSELF, WE HAVE SELECTED EQUIPMENT WHICH WILL PROVIDE US WITH THE CAPABILITY TO GRANULATE THEN WASH THE SORTED, POST-CONSUMER POLYSTYRENE IN LARGE, INDUSTRIAL - SIZED WASHING EQUIPMENT, SELECTED AFTER TESTING SEVERAL TECHNOLOGIES WITH CONTAMINATED FEEDSTOCK, IN PLACES SUCH AS GERMANY, ITALY AND UNITED STATES. THE FEEDSTOCK WILL THEN BE DRIED, EXTRUDED AND PELLETIZED.

THE FINAL STEP IN THE PROCESS IS THE MARKETING OF THE PELLETIZED, RECYCLED POLYSTYRENE. OVER THE PAST YEAR, WE HAVE CONDUCTED EVALUATION TRIALS, USING SAMPLES OF RECYCLED

PELLET FROM A POLYSTYRENE RECYCLING FACILITY IN THE UNITED STATES. THESE TRIALS GAVE US VALUABLE INFORMATION ON THE QUALITY CONTROL MEASURES WE MUST UTILIZE IF WE ARE TO PRODUCE A MARKETABLE PELLET.

THERE IS A DEMAND FOR THIS PELLET, FROM PRODUCERS OF OFFICE SUPPLIES SUCH AS LETTER TRAYS, RULERS AND SCISSORS, AND THE PRODUCERS OF FOOD TRAYS AND HORTICULTURAL PRODUCTS. I RECEIVE REGULAR ENQUIRIES FROM MANUFACTURERS FROM THESE SECTORS, ASKING WHEN THIS MATERIAL WILL BE AVAILABLE. IT SEEMS TO ME OUR CHALLENGE WILL BE TO PRODUCE ENOUGH VOLUME TO MEET THEIR REQUIREMENTS.

TURNING NOW TO CPRA'S ACTION PLAN, WE ARE CONCENTRATING MOST OF OUR EFFORTS ON BRINGING OUR FIRST FACILITY INTO OPERATION THIS SUMMER. AS WELL, WE PLAN TO ESTABLISH RECYCLING CAPABILITY IN BRITISH COLUMBIA AND QUEBEC, AND DISCUSSIONS ARE NOW OCCURRING IN BOTH PROVINCES WITH ESTABLISHED RECYCLERS AND GOVERNMENT OFFICIALS.

THE MISSISSAUGA FACILITY IS NOW CONSTRUCTED, AND IN APRIL THE CPRA OFFICES MOVED IN. IT IS LOCATED JUST NORTH OF THE PEARSON AIRPORT, NEAR BRAMALEA AND DERRY ROAD. IT IS CANADA'S FIRST, FULL SERVICE POLYSTYRENE RECYCLING PLANT, WITH 80,000 SQUARE FEET AND UP TO 15,000 TONNES ANNUAL CAPACITY. IT WILL HAVE CAPABILITY TO RECYCLE ALL TYPES OF POLYSTYRENE - POST-CONSUMER AND POST-INDUSTRIAL, USING

RECYCLING TECHNOLOGY WHICH WE HAVE SELECTED, FOLLOWING A CAREFUL REVIEW OF AVAILABLE TECHNOLOGY AND VENDORS, IN CANADA AND THE U.S.

LET ME SAY A BRIEF WORD ABOUT WHO IS PAYING FOR ALL OF THIS, WHICH INCLUDES CAPITAL INSTALLATION COSTS OF \$2.8 MILLION DOLLARS FOR THE MISSISSAUGA FACILITY, AND ON-GOING OPERATING AND ADMINISTRATIVE COSTS FOR THIS PLANT AND THE CPRA ORGANIZATION.

RECYCLING FOODSERVICE POLYSTYRENE IN PARTICULAR IS NOT A PARTICULAR ATTRACTIVE BUSINESS PROSPECT. OUR MEMBERS REALIZE THAT, BUT ARE FIRMLY COMMITTED TO MAKING IT HAPPEN, AND ACHIEVING OUR TARGETS. TO DATE, THEY HAVE COMMITTED SIGNIFICANT FINANCIAL AS WELL AS STAFF RESOURCES TO THE ORGANIZATION. ALL MEMBERS PAY A FLAT-RATE ANNUAL FEE; OUR RAW MATERIAL SUPPLIERS AND POLYSTYRENE MANUFACTURERS' ANNUAL FEES, PLUS A MONTHLY FEE FOR THE CAPITAL AND OPERATING COSTS OF OUR RECYCLING FACILITIES, ARE CALCULATED ON THE BASIS OF THE ANNUAL VOLUME OF POLYSTYRENE RESIN OR PRODUCT SOLD IN CANADA.

THIS IS A SUBSTANTIAL COMMITMENT, AND DEMONSTRATES THEIR DETERMINATION TO PUT THEIR MONEY ON THE TABLE, AND MAKE POLYSTYRENE RECYCLING IN ONTARIO AND CANADA A REALITY.

ON A FINAL NOTE, LET ME SIMPLY SAY THAT THE EASY PART IS BEHIND US. ANYONE, I SUPPOSE, CAN SIT DOWN AND ESTABLISH AND ANNOUNCE AMBITIOUS RECYCLING OR WASTE REDUCTION TARGETS. ITS QUITE ANOTHER THING WHEN THE RUBBER HITS THE ROAD - IF YOU WILL FORGIVE MY EVOCATIVE METAPHOR - AND YOU HAVE TO GET OUT THERE AND MAKE IT HAPPEN, PARTICULARLY IN AREAS WHERE NO ONE HAS TRIED. IN TEN MONTHS, CPRA HAS PLANNED, HAD CONSTRUCTED AND IS ABOUT TO PUT INTO OPERATION WHAT WILL BE ONE OF THE COUNTRY'S LARGEST RECYCLING PLANTS.

I THINK THAT IS A SIGNIFICANT ACCOMPLISHMENT. BUT ITS ONLY A START, DOWN A LONG, CHALLENGING ROAD. WE HAVE MUCH WORK AHEAD OF US, AND I AM DETERMINED THAT WE DO IT WELL. JUST WATCH US!

RECYCLING I/C/I WASTE -
A WMI WASTE MANAGEMENT SUCCESS STORY

by

Bob Webb, Business Development Manager,
WMI Waste Management of Canada Inc.,
Toronto, Ontario

At the time of assembly of the Proceedings for printing, a text of the author's paper had not been submitted for inclusion in the numerical sequence.

If the paper was subsequently received, it is incorporated in these Proceedings following the listing of the Conference delegates.

Otherwise, those wishing further details on this subject are asked to contact the author direct.



Moderator: Gerry Ronan, Assistant Deputy Minister, Environmental Services Division, Environment Ontario, Toronto



Drew Blackwell, Assistant Deputy Minister, Waste Reduction Office, Environment Ontario, Toronto



Jack Pos, President, Jack Pos & Associates Ltd., Guelph, Ontario



David Sparling, Manager, Ontario Government Waste Management Program, Ministry of Government Services, Toronto, Ontario



Bob Squires, Section Head, Office of Waste Management, Environment Canada, Ottawa, Ontario



Dan Balfour, Recycling Manager, Solid Waste Operations, Regional Municipality of Waterloo, Waterloo, Ontario

THE WASTE REDUCTION ACTION PLAN
FOR ONTARIO

by
Drew Blackwell, Assistant Deputy
Minister, Waste Reduction Office,
Environment Ontario, Toronto

The author spoke from notes and overhead
transparencies. The text of those transparencies
follows.

WASTE REDUCTION OFFICE

Organization Chart

Assistant Deputy Minister

Executive Assistant

Outreach/Liaison/OTA

Working Groups

Chair

Chair

Chair

Chair

ICI DRY

Residential DRY

WET

Master Plans

Waste Reduction Policy

Master Plans

Technology Assessment and Support

Technology and Product Development

Market Facilitation

Market Research and Evaluation

Information Systems

Administration

Policies and Programs

Technology Development

Marketing

Data and Support

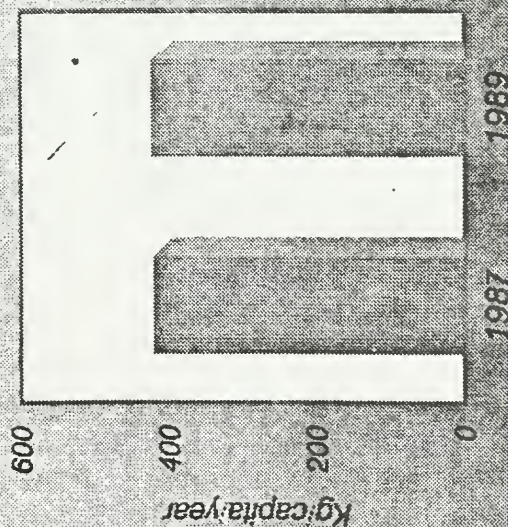
Concepts, Opportunities

Development, Delivery

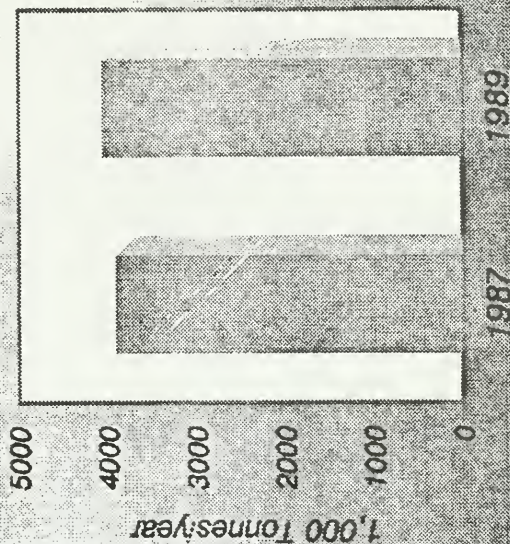
Process Management, Priorities, Strategies

TRENDS IN ONTARIO'S MUNICIPAL SOLID WASTE GENERATION

Residential waste generation
rates are stable...



Waste quantity is tracking
population growth...

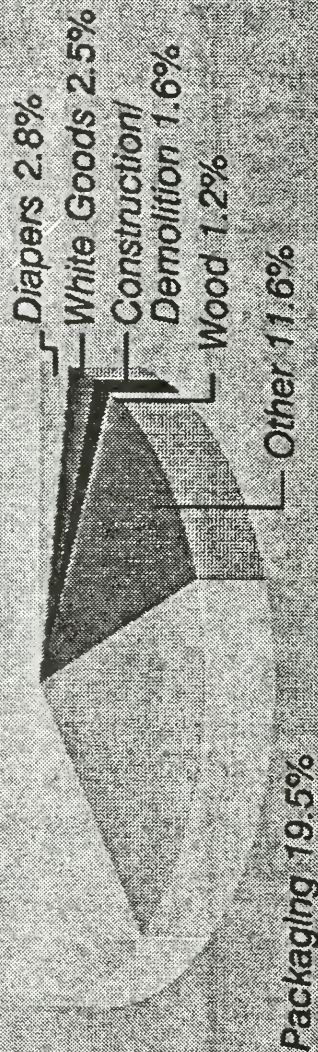


1987 RESIDENTIAL WASTE COMPOSITION

(% By Weight)

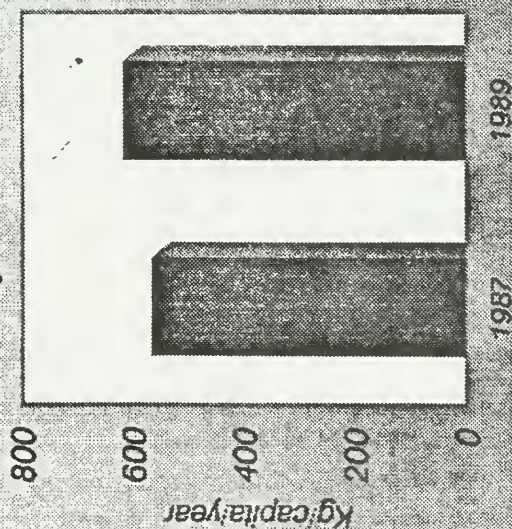
Paper 29.2%

Organics 31.6%

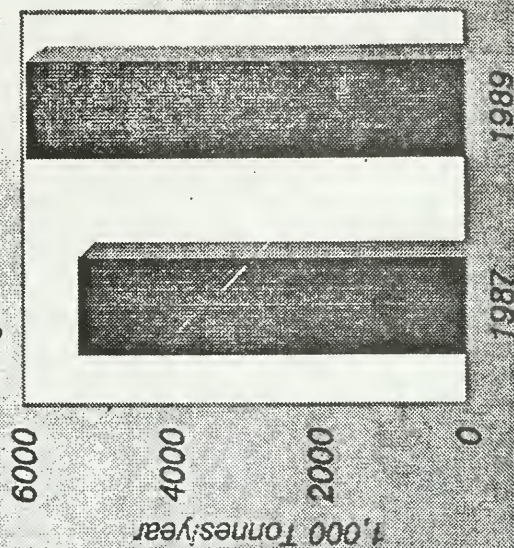


TRENDS IN ONTARIO'S MUNICIPAL SOLID WASTE GENERATION

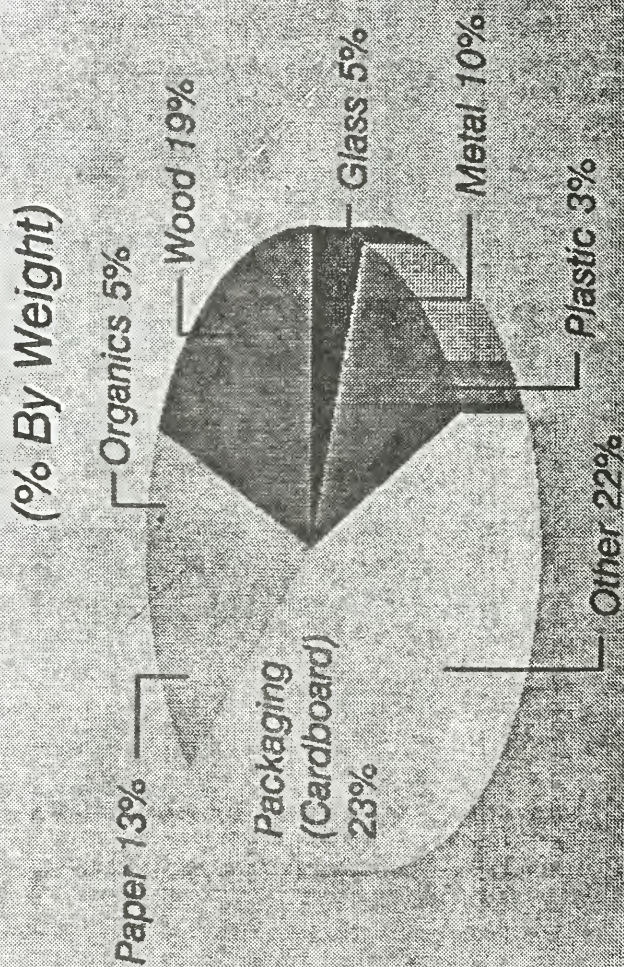
ICI waste generation rates
are rising...



Waste quantity is also
rising...

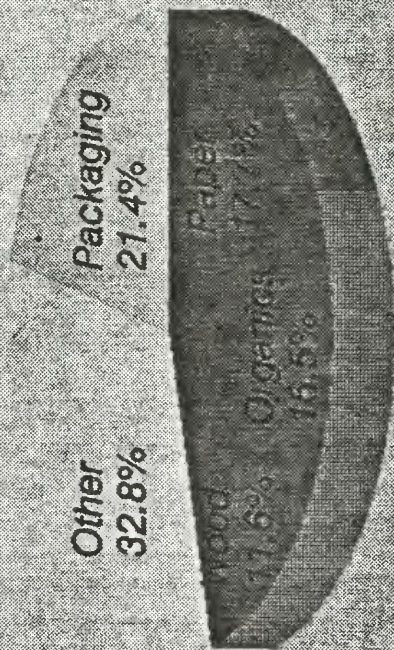


1987 INDUSTRIAL, COMMERCIAL, INSTITUTIONAL WASTE COMPOSITION



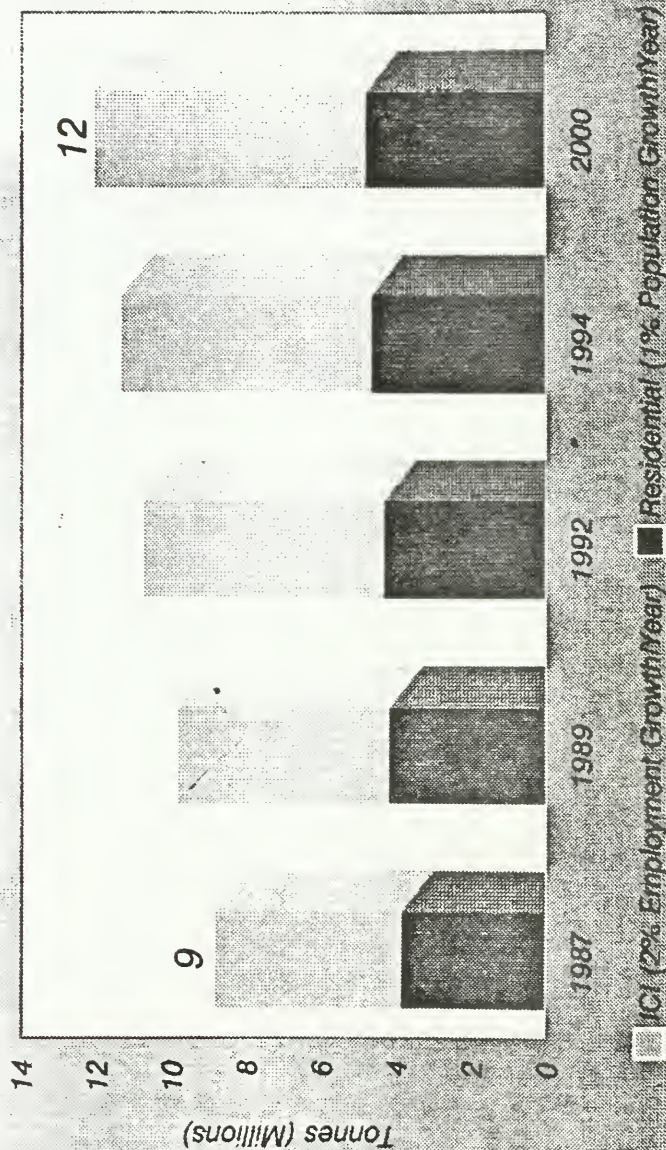
1987 TOTAL MUNICIPAL SOLID WASTE COMPOSITION

(% By Weight)



Other	
Residential	ICI
White Goods	Glass
Construction	Metal
Demolition	Plastic
Other	Tires
	Other

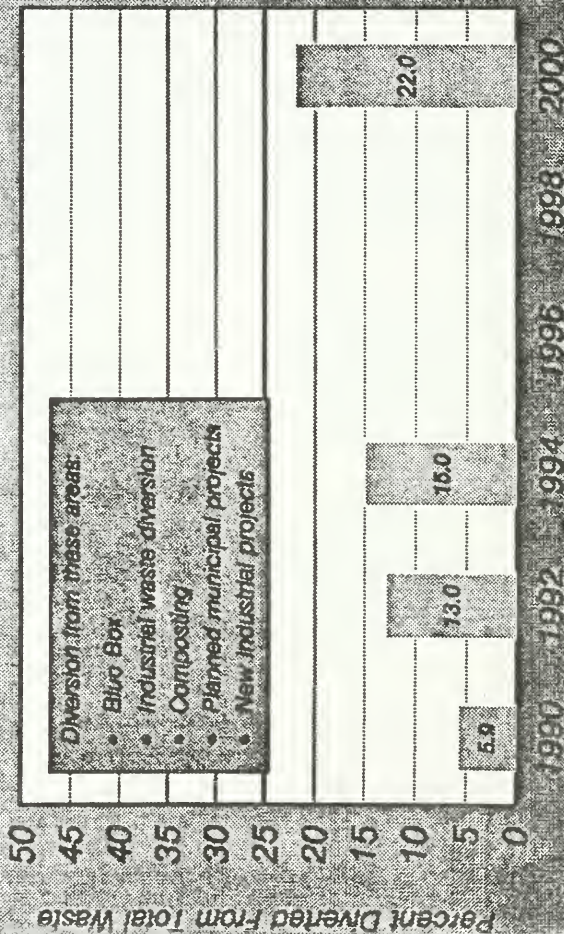
WASTE GENERATION BASED ON CURRENT TRENDS



CURRENT 3RS SUPPORT PROGRAMS

Program	Funding Available
Municipal Recycling • Blue Box	• 1/3 Capital • 50%-10% Operating • Shared: OMMRI/Municipality
• Composting • Wet/Dry	• 1/3 Capital
Municipal Reduction/Reuse	• Up to 50%
Industrial/ Waste Diversion	• Up to 50% Capital • Up to 100% R&D
Student Action for Recycling (STAR)	• 2/3 Capital

EXISTING WASTE DIVERSION



WASTE REDUCTION ACTION PLAN STRATEGY

- *Strong Regulatory Measures*
- *Financial and Technical Systems*
- *Outreach/Education Activities*
- *Encouragement of Markets*

REGULATORY MEASURES

- *ICI Source Separation*
- *Waste Audits and Packaging Reduction*
- *Municipal Source Separation*
- *Composting Leaf and Yard Waste*

ICI SOURCE SEPARATION

- Retail Malls
- Construction/Demolition Sites
- Office Complexes
- Hotels, Restaurants
- Schools, Colleges, Hospitals
- Manufacturing Industries

Examples:

- Newspapers, Cardboard, Fine Papers
- Wood, Drywall
- Glass, Cans, Plastics

WASTE AUDITS/WASTE REDUCTION PLANS

- *Major Packaging Users*
 - *Food Packaging*
 - *Beverage Containers*
 - *Chemical Manufacturing*
 - *Paper and Allied Products*
- *Support National Packaging Protocol*
- *Major Industrial, Commercial, Institutional Sectors*

MUNICIPAL SOURCE SEPARATION

- *Municipalities with More than 5,000 People
Must have a Recycling Program*
- *Curbside Collection or Rural Depots*
- *News, Glass, Metal Cans, PET Plastics*

COMPOSTING LEAF AND YARD WASTE

- Leaves, Lawn Cuttings, Brush, etc.
- Disposal in Landfill Prohibited
- Compost the Only Accepted Approach

ENHANCE EXISTING FUNDING PROGRAMS

Municipal 3Rs

- *Extend Eligibility Period*
- *Increase Operating Grant Share to 33%*
- *Enhance Funding to Northern Ontario*
- *Accelerate Backyard Composting*
- *Expedite Central Composting*
- *Encourage Municipal Waste Audits*

ENHANCE EXISTING FUNDING PROGRAMS

Industrial 3Rs

- *Encourage Expanded ICI Activities*
- *Ensure Market Demand Keeps Pace*
- *Expedite Processing of Proposals*
- *Industry Projects Include:*
 - *Users of materials (Markets)*
 - *Service Providers (Recyclers)*
 - *Waste Generators (Reduce, Reuse)*

APPROVALS FOR RECYCLING FACILITIES

- *Now Need EPA Certificate of Approval*

- *Facilliate for Recycling Systems*

1. Recyclable Material Exempt

2. Adopt "Permit-By-Rule" Approach

- *Ensure Environmental Protection*

MARKETING GROUP

Objective: • Facilitate Sale of Secondary Materials

Principles: • Aggressive Marketing Strategy

• Co-operative Approach Enlisting All Stakeholders

Key Activities: • Identify Industries Using Secondary Materials

• Develop New Uses for Secondary Materials

• Establish Marketing Agency

• Technical Assistance to Assure Marketability

• Regulations to Encourage or Require Use of Secondary Materials

• Public Sector Procurement Strategy to Support Use of Secondary Materials

• Macro- and Microeconomic Information to All Stakeholders

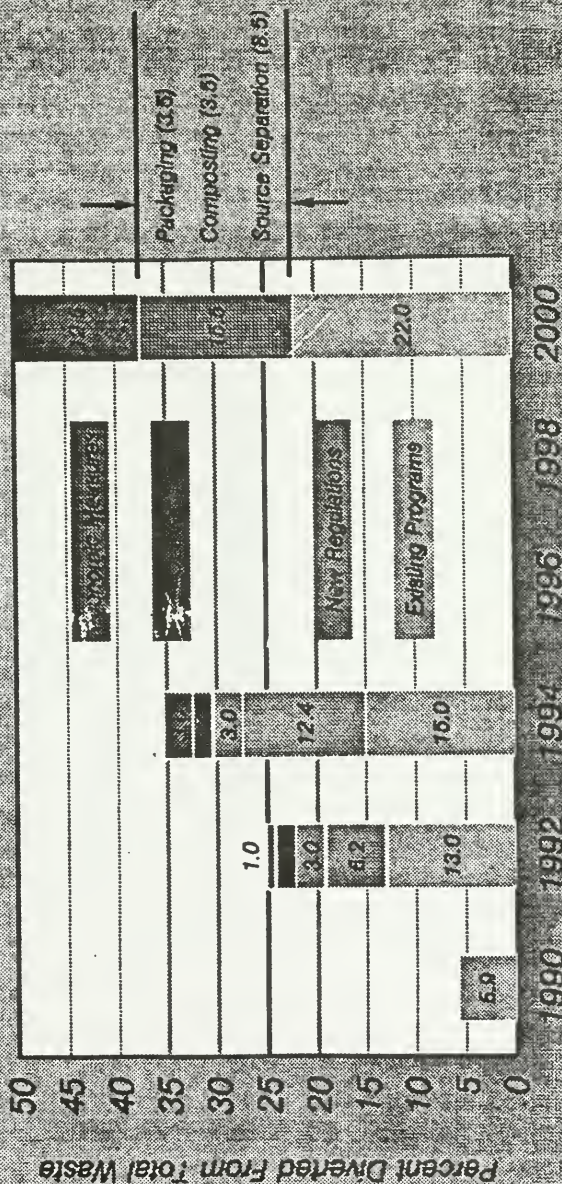
OUTREACH, PUBLIC EDUCATION

- *Trained Support Staff*
- *Grassroots Seminars/Workshops*
- *Technical Guides and Manuals*
- *Resource Materials*
- *Use Community Organizations*
- *Promotional Materials*

SUPPORT INTERMINISTERIAL ACTIVITIES

- *MGS Environmental Program*
- *MCCR/LCBO deposit/refund system*
- *MMA municipal authority reforms*

WASTE DIVERSION WITH ACCELERATED 3Rs



FUTURE INITIATIVES

- *True Cost Accounting System*
- *Account for All Waste Management Costs*
- *Users Charged Accordingly*
- *Pay for Entire System Including 3Rs*

THE GREENING OF THE GOVERNMENT

by
David Sparling, Manager, Ontario
Government Waste Management Program,
Ministry of Government Services,
Toronto, Ontario

On March 10th, 1989, the Government announced waste reduction goals for the Province of Ontario. These goals are to reduce the amount of waste going to landfill and incineration by 25% by the year 1992 and 50% by the year 2000. In order to meet these goals, the province set aside funding of \$225 million.



The necessity for this approach is due to the continuing landfill crisis in Southern Ontario and the escalating cost of waste removal. Unless the Greater Toronto Authority moves quickly, Toronto, for instance, will be out of landfill capacity by 1992 with the surrounding regions struggling to find capacity for their rapidly increasing populations. It is intended that this reduction in waste be met through the 3R's of Waste Management - that is **Reduction, Reuse and Recycle**.

The primary responsibility to meet these goals belongs to the Ministry of the Environment who will be giving industry incentives to reduce their waste along with regulatory initiatives to ensure that the goals are met. The Ministry of Government Services, whose primary job is to house and supply government offices, was given the responsibility to ensure that the government led the way with its own waste reduction program.

Each of the in excess of 80,000 government employees generates between 556 pounds of waste per year. That adds up to 22,240 tons of waste. This does not include the many thousands more tons of waste generated in parks, penal institutions, colleges, courts and other government agencies. Aside from this, the Ontario government puts out thousands of reports, pamphlets and brochures which eventually wind up in the waste stream. In waste audits conducted in our office

buildings between 70% and 90% of the waste generated at the workstations is recyclable. The cafeteria wastes are mostly compostible.

This means that the waste coming from our office buildings can be reduced by at least 70% by putting in efficient recycling and composting systems to service our employees. Assuming an average tipping fee (cost to dispose of 1 ton of garbage at a landfill) of \$50/ton, the government would realize a saving of \$750,000 per year. This does not include the rental of dumpsters nor does it take into account any revenue that could be generated through the sale of recyclables such as fine paper and corrugated cardboard.

To achieve our recycling goals, a comprehensive recycling system has been instituted in our buildings. Each office worker receives a desktop recycling container which he/she empties into a fine paper recycling bin. Each floor has a newspaper recycling bin and a blue box. Janitorial staff collect the materials from the various bins and take them to the storage area where they are stored and picked up on a regular basis by a recycler. Corrugated cardboard is also recycled, mainly from the services areas and cafeterias.

To this point in time our program has covered between 65,000 and 70,000 employees across the Province. Results of the program have been very encouraging with a 29.4% reduction rate achieved in the Queen's Park complex alone. In the month of July we recycled 17.4 tonnes of waste from 7,000 employees. This realized a saving of \$1,700. in tipping fees. If we were to add the 12 tonnes of food waste we ship to a hog farmer each week, the diversion rate for the Queen's Park complex increases to 38%.

We now have programs in place from Kenora to Ottawa covering over 70% of government buildings and employees.

As you can see, the program is not only significantly reducing our waste but it is saving a considerable amount of money, e.g. up to \$30,000 in tipping fees/year.

Our **recycling** program has been designed to divert waste and reduce disposal costs. It is not a revenue generating program. For this reason we have taken a wide range of recyclables in our fine paper program and do not require staff to do a lot of sorting, etc. At this point in time few of our buildings are being charged by the recycler for pickup.

Since janitorial services are responsible for waste disposal, the extra cost in collecting recyclables from each floor is offset by the savings in waste disposal tipping fees.

Recycling is the first part of our reduction program. It is the easiest to implement and it gets the employees involved and interested. By the end of 1991 I hope to have 80% or over 80,000 employees covered. I would bet that this is the largest office recycling program in North America.

In November of last year we, in conjunction with the Canadian Polystyrene Recycling Association, instituted a pilot project in the Queen's Park Complex to recycle polystyrene. This program has been very successful and we are expanding it to cover as many buildings in the G.T.A. as possible.

Our next major effort will be in trying to reduce the production of waste. We will be expanding our double-sided photocopying program to other ministries. Research has indicated that we can reduce the number of photocopies by over 30% by purchasing automatic double-sided photocopiers. The savings in paper alone will pay for the added features in the photocopier if your machine is producing more than 10,000 copies/month.

We will be doing selective audits on our recycling material and our waste stream to determine exactly what we do discard. This will enable us to focus our purchasing and reduction efforts to maximize our efforts.

I would bet that a significant percentage of our waste is forms. **Reducing** the number of forms will have a significant impact on our waste stream. We can accomplish this by using computer generated forms or limiting forms to single copies. We will be spending a considerable amount of time and money researching and implementing electronic mail, and other computer systems to take advantage of the technologies already in place in our buildings. Did you know that a fax card (which cost about the same price as a fax machine rented for one year) for your computer a modem will enable you to receive faxes and in conjunction with a scanner will allow you to send faxes. This will eliminate the non-recyclable fax paper and in many cases eliminate paper all together especially when it is a simple message such as "meet me for lunch".

Along this same line we are going to pilot the paperless office concept in our office. Every letter, etc. coming into the office will be scanned and placed on a disc then electronically forwarded to the responsible individual for handling. Paper will only be used to send out replies and only to those individuals who do not have compatible computers. I hope that by going this route I will be able to see my desktop within a couple of days.

We will also be looking at a paper folding system for government generated cheques which will reduce the number of envelopes we use per year by over 10,000,000. In the **Reuse** area, we have distributed 16,000 coffee cups to eliminate the thousands of cubic yards of waste shipped annually in the form of polystyrene cups. We hope to accelerate this program with reusable cups being sent to all employees working in facilities with cafeterias.

Purchasing is another area where the Provincial Government can have a major influence, not only on our own waste stream but in creating markets for recycled materials.

In June 1990, Management Board of Cabinet mandated MGS to purchase all fine paper products (photocopier paper, letterheads, etc.) with a 50% recycled content according to the Environmentally Friendly Products criteria instituted by the Federal Government. Contracts have been let to the tune of \$6.8 million. All government offices, boards, agencies must purchase under this program.

Ministry of Transportation instituted a program requiring all fleet vehicles to be serviced with recycled oil. Other programs will deal with recycled paint and insulation. We are working with our Design Services Branch to ensure that products purchased for construction of our new buildings are made of recycled material or are recyclable and that all master specifications have a strong environmental component.

In May Cabinet gave MGS a new and more comprehensive program initially named Greening Government Operations. We have been given the added responsibility of reducing energy and water consumption in all government operations. Internal air quality and air emissions will also be monitored and brought up to the higher standards.

Energy and water audits are already underway with implementation or reduction program to begin this fiscal year.

Our program is indeed leading the way. We will be communicating our success and experiences to the Ontario business community on an on-going basis. If you have any questions, you can contact us at 327-3Rs (327-3777).

NATIONAL PACKAGING PROTOCOL
A COMPONENT OF A NATIONAL WASTE REDUCTION
STRATEGY

by
R.J. Squires, Section Head, Office
of Waste Management, Environment Canada,
Ottawa

Background

The management of waste in Canada is indeed a significant problem and one that requires immediate attention. Most recent statistics indicate that Canadians generate 30 to 35 million tonnes of waste per year, of which about 16 million tonnes are from household and commercial sources. In 1989, Canada produced more waste than any other country in the world; 1.7 kilograms per person per day. Overall, Canadians spend over \$1.5 billion per year on waste management activities.

Packaging makes up approximately 30% of the municipal solid waste stream. The consumption of packaging in Canada stands at an estimated one tonne of packaging per family per year. It is estimated that 6.6 million tonnes of packaging were used in Canada in 1988. Of this total, some 5.7 million tonnes were disposed of through a number of methods including landfill and incineration, at an estimated cost in excess of \$100 million.

The Canadian Packaging Industry

Packaging serves many useful and important functions in our consumer oriented society. More notably, it is used to contain, transport, protect and market goods, as well as to provide product information to the consumer. It is commonly composed of one, or a combination of, six basic material types including; paper or paper products, plastics, wood, glass, steel and aluminum. Some typical examples of packages include pallets, boxes, bottles, cans, jugs, drums, wrappers.

The packaging industry is a major contributor to the economic well being of the Canadian economy. More than 52,000 persons are employed in the Canadian packaging industry. The total value of packaging produced in Canada in 1988 was over \$7 billion.

The Protocol Development Process

In May, 1989, the Canadian Council of Ministers of the Environment (CCME), which is an association of Canada's federal, provincial and territorial ministers of the environment, recognized the seriousness of the waste management problem in Canada. Due to the fact that packaging materials are a significant component of the waste stream, it commissioned a National Task Force on Packaging. This Task Force was given the mandate to:

"Develop a National Packaging Policy for Canada within the broad review of solid waste management opportunities, including government purchasing and recycling policies".

In the formation of Canada's National Task Force on Packaging, it was decided that representatives from all of the "stakeholders" in this issue should have an opportunity to input into the process of developing this national initiative. Consequently, membership was solicited from municipal, provincial and federal governments, the manufacturing, shipping and retail sectors of industry, and environmental and consumer organizations. It drew upon their experience and interest in packaging to obtain a broad basis of input for the development of the National Packaging Protocol. In addition, six regional meetings were held in various geographical areas across Canada to provide an opportunity for the general public, and other organizations not represented on the Task Force, to contribute.

Task Force members were particularly prompted by public demand for packaging which is sensitive to the environment (i.e., which is compatible with waste reduction and with the wise use of energy, water and other resources). The Task Force was also aware of the fragmented approach to packaging in the United States, which has led to undesirable economic consequences for industry and, ultimately, for the consumer. In general, the work of the Task Force was governed by the need for a national approach to packaging minimization through reduction, reuse and recycling.

The Task Force agreed that the Protocol would concentrate on industrial, household and commercial packaging, and would be developed in consultation with key stakeholders. The Task Force focused on the management of packaging through source reduction, reuse and recycling. It did not consider disposal options such as incineration. Neither did it consider the effects that disposal techniques such as incineration and landfill have on package design. Concurrent with the development of the Protocol, the Task Force commissioned a number of technical reports on all aspects of packaging. These included such topics as packaging design and manufacturing, consumer uses and attitudes, environmental and economic considerations, and legislative initiatives.

The National Packaging Protocol

The National Packaging Protocol consists of six recommended packaging policies for Canada.

Policy Number 1. All packaging shall have minimum effects on the environment.

The environmental impact of packaging extends beyond the effect of its disposal; the quantity of packaging waste is not the only issue. Resources and energy are consumed to produce and transport packaging. A consideration of broader environmental consequences should be included in an assessment of the impact of packaging.

The Protocol will address these broader consequences through the preparation of environmental profiles for each type of package. This will be followed up by implementing modifications to product and packaging design in order to minimize adverse environmental impacts. The Protocol will also stimulate research and the development of new packaging products which have minimal effects on the environment.

Policy Number 2. Priority will be given to the management of packaging through source reduction, reuse and recycling.

The federal government, in consultation with industry and the multi-stakeholder group, will establish a "Code of Preferred Canadian Packaging Practices", to guide industry in the design of products and in the selection and design of packaging according to the following hierarchy of desirability:

1. No packaging
2. Minimal packaging
3. Reusable packaging
4. Recyclable packaging and packaging containing recyclable material.

Policy Number 3. A continuing campaign of information and education will be undertaken to make all Canadians aware of the function and environmental impacts of packaging.

Responsibility for the management of packaging is shared. Achievement of the National Packaging Protocol targets requires the combined resources of government, industry, consumer and special interest groups. Education programs are necessary, both to inform and motivate purchasers to make appropriate choices, and to support the development of a consumer society. Canadians need to be informed of the functions, as well as the environmental impacts of packaging, so that they can be encouraged to make environmentally sound purchasing choices.

Policy Number 4. These policies will apply to all packaging used in Canada, including imports.

It is important that the National Packaging be applied to all packaging, domestically produced and imported from other

countries. Regardless of its country origin, all packaging used in Canada will require management in Canada. Policy Number 4 will ensure a level playing field and prevent any packaging product from gaining a competitive advantage at the expense of the environment. Efforts will be undertaken to ensure effective monitoring of border markets against the entry of non-complying products.

Federal, provincial and municipal governments will, with sensitivity to the needs of local industries, establish standards and regulations to apply the National Packaging Protocol to all packaging used in Canada, including imports. The federal government will act as liaison with other countries to promote the policies of the National Packaging Protocol with respect to international trade.

Policy Number 5. Regulations will be implemented as necessary to achieve compliance with these policies.

Monitoring the process achieved through voluntary initiatives may indicate a need for regulatory measures to ensure that the effects of the National Packaging Protocol are felt equally, and that targets are met. Federal and provincial governments will, in consultation with the multi-stakeholder group, develop a recommended legislative and regulatory framework which is consistent across Canada. This framework will specify performance requirements, targets and deadlines for achievements consistent with the National Packaging Protocol.

Policy Number 6. All government policies and practices affecting packaging will be consistent with these national policies.

In environmental and other public policy areas, existing and new government policies will be reviewed to ensure consistency with the National Packaging Protocol. Health, safety, technical and other factors must not be compromised, however, they will need to be assessed in order to identify conflicts or barriers to the achievement of the objectives of the National Packaging Protocol.

Government policies and practices which impede the objectives of the National Packaging Protocol will be identified and, where possible, removed or modified. Government policies and practices such as procurement will be developed and implemented to support the achievement of the objectives of the Protocol.

The six packaging policies constitute the basis for the development of a plan of action, with specific waste reduction targets and schedules. These aim to reduce the volume of packaging waste sent for disposal by 50 per cent from 1988 levels, by the year 2000.

Milestone Targets

The National Packaging Protocol has set a number of targets as cumulative national goals. As has been noted, a regulatory framework is being prepared for quick implementation in the event that targets are not met voluntarily.

The National Packaging Protocol has established a series of four milestone targets:

By December 31, 1990, all provinces must have in place a nationally coordinated data collection program to make possible the monitoring of the following targets.

By December 31, 1992, packaging sent for disposal in Canada shall be no more than 80 per cent of the amount sent in 1988.

By December 31, 1996, packaging sent for disposal in Canada shall be no more than 65 per cent of the amount sent in 1988.

The Protocol also dictates that 50 per cent of the packaging waste reduction shall be achieved through new source reduction and reuse initiatives. Recycling programs will make up the remainder. Packaging waste reductions are to be measured in weight and are absolute numbers, i.e. they are not per capita, or adjusted for population or economic growth.

Specific targets will be established for various industry sectors, in order to achieve Protocol goals. It is incumbent on those industry sectors unable to meet Protocol requirements, to provide adequate supporting documentation and alternative targets, one year in advance of the prescribed deadline.

Although these milestone targets may be considered aggressive, the Canadian Council of Ministers of the Environment, and the National Packaging Task Force, firmly believe the Protocol's targets and objectives are realistic and attainable and every effort will be made to achieve them.

Implementation

The work of drafting the National Packaging Protocol has been completed and it was endorsed by the CCME on March 20, 1990. The task of realizing the objectives of the Protocol and actually reducing the amount of packaging waste sent for disposal, has begun in earnest. Various activities are well underway to ensure the Protocol's targets become a reality.

The National Packaging Task Force and its multi-stakeholder group have been charged with the task of implementing the Protocol. During the Protocol's development, an "Agenda for Action" was outlined and was considered to be a important tool that would specify the types of activities that should be initiated, as well as the associated time frames. Priority actions were identified, and several sub-committees have been set up to work on these key activities that are closely linked to the six specific policy statements that make up the Protocol.

Agenda for Action

1. The National Packaging Monitoring System

One of the fundamental weaknesses in comprehensive waste management strategies in most jurisdictions in Canada today, is the inadequate knowledge of the qualitative and quantitative components of the waste stream. This often results in decisions being made based on what is perceived to be the problem, rather than a good scientific base. The National Packaging Task Force recognized the need to have a much more reliable data base of information, in which to track the progress towards meeting the packaging waste reduction targets. Consequently, the first milestone target of the NAPP, was to develop a "Nationally Coordinated Data Collection and Monitoring System" by December 1990.

The specific objectives of this data base are:

1. To identify and track the amount, and fate of packaging produced, used and consumed in Canada.
2. To monitor progress towards meeting the NAPP targets.
3. To help identify any obvious barriers to progress.
4. To assist governments in making significant policy decisions on waste management strategies at the provincial and national level.

The National Packaging Monitoring System (NPMS) will collect packaging data from two major sources, Statistics Canada and individual establishments. The information from individual establishments will be collected from an annual survey of a representative sample of companies in Canada. Companies will be asked to provide information on packaging depending upon whether they are a producer, user and/or a consumer of packaging. Included in this system is the ability to track the amount of packaging that is imported into, and exported out of, Canada.

The NPMS will collect the amount, by weight, of packaging in Canada and produce aggregate information reports according to these major characteristics:

- Industry Cluster - each company in Canada has been grouped into one of 31 industry sectors as defined by their respective SIC Codes (Standard Industry Classification).
- Packaging Cluster - all packaging materials currently in use in Canada, have been grouped into 36 non-overlapping packaging types, spanning the seven major materials i.e. plastics, glass, wood, paper, textiles, multi-materials and metal), and described according to the Statistics Canada (HS) Harmonized System.
- Year - data will be collected on an annual basis in order to maintain an efficient and reliable base of information, and to determine the effectiveness in meeting the interim targets.
- Jurisdiction - each province in Canada will be able to determine the relative performance of their province in relation to the National goal.
- Packaging fate - data will be collected in order to determine the production, use, reuse, recycling and disposal rates of packaging materials.

In May/June of 1991, Statistics Canada distributed questionnaires to approximately 10,000 establishments in Canada on behalf of the CCME, requesting very specific information on packaging for the year 1990. In addition, a census of primary and secondary processors of recycled materials will determine the amount of materials that are not only returned for recycling from industrial sources, but also from municipal collection systems, such as blue box programs. The data collected from individual companies, will be maintained by Statistics Canada and its disclosure subjected to the normal rules of confidentiality that are inherent in any Statistics Canada survey. Only aggregate information, as described by the previously noted characteristics, will be available to the major users of the data, provincial and federal environment ministries.

2. Legislation & Regulatory Development

When the National Packaging Protocol was adopted in March 1990, the CCME recognized that the development of a legislative and regulatory framework to support the Protocol's objectives was a priority. To this end, the National Packaging Protocol Legislation Sub-Committee has produced a proposal which outlines the elements that should be included in comprehensive packaging legislation.

This Sub-Committee was comprised of representatives from Environment Canada, Justice Canada, several provincial Task Force Representatives, Canadian Environment Law Association, GPMC, CTCR, PAC and the Federation of Canadian Municipalities.

The work of the Sub-Committee is broken down into two distinct phases. Phase I is the development of nationally consistent enabling legislation, that would give the appropriate federal or provincial jurisdiction the authority to regulate in any of the areas considered in the packaging legislation. Phase II, is the more controversial and detailed work, which involves outlining the specific wording and contents of the regulations that would be needed to achieve the objectives outlined below.

The specific objectives of the NAPP Legislation, Regulatory, Development are:

- 1) To promote National Uniformity and Harmonization towards packaging legislation by all jurisdictions.
- 2) To create a "level playing field", both within Canada and internationally for packaging producers and users.
- 3) To ensure the NAPP Packaging Waste Reduction Targets are met.

The Phase I activities of the subcommittee completed to date include a status report outlining the extent of existing packaging legislation in Canada. The group compiled and prioritized a comprehensive list of what specific legislative initiatives may be required to fulfill the objectives of the Protocol. Due to the fact that many relevant jurisdictional responsibilities are shared, the subcommittee determined which elements of packaging legislation should be provincial and those that are of national significance, and consequently may involve the federal government. Upon completion, these recommendations for provincial and federal elements of enabling packaging legislation were adopted by the CCME. It is now up to each individual jurisdiction to include it in their own specific legislation. It must be noted that the vast majority of the elements in this report are not new. In most cases, at least one jurisdiction in Canada has the authority to accomplish one or a number of the elements.

Phase II activities relating to regulation development, begun in May, so that the completed package will be ready by 1992 in the event that voluntary actions by industry do not achieve the first target.

3. Communications

The communications sub-committee was formed in April 1990 to assist the National Task Force on Packaging in fulfilling its commitments in the area of communications. The sub-committee is

composed of representatives from industry, government and non-government organizations.

The mandate of the communications sub-committee is derived from Policy 3 of the National Packaging Protocol (NAPP). Accordingly the sub-committee has two main functions:

1. Promote the NAPP, the implementation of specific policies, the technical projects according to the action agenda of the Task Force.
2. Develop a national program that will inform all Canadians of the functions and environmental impacts of packaging and encourage environmentally sound purchasing practices.

In order to achieve these functions, the sub-committee has developed a communications plan as a priority activity. This plan has been endorsed by the CCME and received funding for activities in 1991/1992.

The plan consists of three main activities:

1. Speakers Program

- (a) speakers kit - generic speeches, presentation tips, overheads, publications, fact sheets (Produced)
- (b) video - 6-8 minutes, primarily for industry highlighting initiatives to reduce packaging wastes
- (c) display - portable generic display for use as backdrop at speaking and media events

2. Media Relations Program

- (a) media kit - same as speakers kit, including backgrounder, contacts and information for media contacts
- (b) "feature article bank" - articles, summaries of technical papers, case histories and testimonials, camera ready feature articles and fillers

3. Publications Program

- (a) brochure - "You Can Make A Difference" (Produced)
- (b) guide - Code of Preferred Canadian Packaging Practices"
- (c) fact sheet series - three fact sheets on packaging
- (d) poster - aimed at households

4. Code of Preferred Canadian Packaging Practices

Policy #2 of the protocol states that "Priority will be given to the management of packaging through source reduction, reuse and recycling". In view of this policy, an important activity was assigned to the federal government which is as follows; "The

federal government, in consultation with industry and the multi-stakeholder group, will establish a Code of Preferred Canadian Packaging Practices to guide industry in the design of products, and the selection and design of packaging".

To this end, industry has taken the initiative to prepare the first draft of this Code for discussion with the remainder of the Task Force. More recently, the federal government has taken stewardship of the Code to ensure that all stakeholder views are incorporated.

The Code consists of a policy statement that is focused on getting a commitment from industry to design, manufacture, use and dispose packaging, in such a way, that the 3R hierarchy of source, reduction, reuse and recycling maximizes the diversion of packaging from the waste stream, thereby achieving the Protocol's targets and objectives. The Code also recognizes the various functions of packaging including important points that packaging must maintain the integrity of the product and insure that all consumer health and safety regulatory requirements are fulfilled.

It is anticipated that the Code will be ready for distribution in September of 1991.

5. Life Cycle Analysis

The National Task Force on Packaging has committed itself to execute work in the field of Life Cycle Analysis and to provide a common basis for the conduct of life-cycle analysis for making packaging choices. The Protocol has outlined three specific actions to be undertaken:

1. The federal government, in consultation with a multi-stakeholder group, will undertake the development of methodologies and guidelines to be used in conducting environmental profiles of packaging, thus allowing users to compare packaging choices.
2. Industry will undertake environmental profiles of their packaging in accordance with the above federal government guidelines, to identify the environmental impacts generated through manufacture, use and post-use management of their packaging.
3. Based on profile outcomes, industry will prepare action plans and schedules to minimize environmental impacts and manage packaging through source reduction, reuse and recycling approaches.

The Task Force sub-committee developed a work plan to develop a flexible tool to assess the environmental impacts associated with packaging. This tool is to assist decision-making by the interest groups discussed earlier. It is thus essential that life-cycle analysis be recognized for what it is: a tool for assisting the decision-making process in minimizing and reducing the environmental impact of products.

The objectives of the sub-committee's workplan are threefold:

1. to identify the implications associated with the use of life-cycle assessments for packaging;
2. to revisit underlying technical and methodological issues of past and present product assessments;
3. to propose a framework which will meet the needs of the users identified above and recognize regional diversity as well as provide a nationally consistent approach in making environmentally sound packaging choices.

The work of the Task Force is also building on work ongoing in the United States. Last August, the Society of Environmental Toxicology and Chemistry (SETAC) sponsored a workshop to discuss life-cycle studies among industry, environmental groups, academia, and LCA researchers. The proceedings from the workshop identify three important phases in a life-cycle analysis: inventory, impact analysis and improvement analysis. Current work undertaken by the U.S. Environmental Protection Agency involves developing a methodology for each of the phases of life-cycle analysis. Canada is participating in these activities through the Peer Review Group for EPA's Life-Cycle Analysis Research.

6. Guiding Principles for Environmental Labelling and Advertising

A recent initiative, spearheaded by the federal Department of Consumer and Corporate Affairs, was the development of some guiding principles for the use and misuse of key environmental terms, phrases and logos. In consultation with Industry, consumer and environmental groups as well as Environment Canada and the National Packaging Task Force, these principles are intended to bring order to the marketplace especially pertaining to the recent wave of green marketing that is widespread all over Canada. Within the context of the Consumer Packaging and Labelling Act and the Competition Act, the document contains broad prohibitions on the use of such vague terms as "Environmentally friendly, ozone friendly or green" so as to prevent misleading or false advertising. In addition, the document spells out very clearly the terms by which absolute claims such as recyclable, recycled/recycled content and degradable and the mobius loop logo, may be used.

The following principles are the key elements of the document;

1. Industry is responsible for ensuring that any claims and/or representations are accurate and in accordance with the relevant legislation.
2. Consumers are responsible, to the extent possible, for appropriately using the information made available to them in labelling and advertising, thereby enhancing their role in the marketplace.
3. Environmental claims and/or representations that are ambiguous, vague, incomplete, misleading, or irrelevant, and that cannot be substantiated through credible information and/or test methods, should not be used.
4. Claims and/or representations should indicate whether they are related to the product or the packaging material.

Copies of this report can be obtained by calling the Department of Consumer and Corporate Affairs at (819) 953-1075.

Conclusions

In conclusion Industry and consumers alike must embrace the concept of Product Stewardship including the Cradle to Grave Management of waste materials. It is important that all sectors of Industry assume their fair share of the responsibility to ensure that packaging materials that they manufacture, use and consume is diverted from disposal. In addition, it is incumbent upon consumers to ensure they do their part by recycling or reusing packaging materials when reasonable access is provided to them.

Given the success of the Protocol to date, the federal government would much prefer to work with industry through a cooperative, consultative dialogue rather than extensive legislation and regulation to achieve the Protocol's targets and objectives.

Industry, as well as all stakeholders in this issue, should view the reduction of packaging waste generation and many other environmental concerns from a "Continuous Improvement" standpoint. One must not be complacent with limited success, but rather strive for environmental perfection in all facets of operations.

The Protocol was built on a cooperative effort of industry, governments and public interest groups. It is important that this initiative succeed as it will set a precedent for industry/government cooperation through "voluntary compliance". As well, it will reinforce the importance of the CCME and the need for federal/provincial harmonization and inter-provincial consistency on national environmental issues.

RECYCLING COMES OF AGE AT WATERLOO
REGION'S MATERIALS RECYCLING CENTRE

by

Dan Balfour, Recycling Manager, Solid
Waste Operations, Regional Municipality
of Waterloo, Waterloo, Ontario

VISION

To provide leadership, programs & services that will enable members of the Region of Waterloo community to practice environmentally sound waste management.

WASTE DIVERSION OBJECTIVES

25% by 1992 (MOE)
36% by 1994 (Region of Waterloo)
50% by 2000 (MOE)

PHILOSOPHY

- Reduce, Re-use, Recycle, Recover in that priority order.
- diversion programs must be sustainable.
- diversion programs must be economically responsible.

WASTE DIVERSION PLAN

- long range (10 year) plan under development.
- will obtain input from municipalities and other stakeholders
- to be completed by summer.

LANDFILL STATUS

- existing Waterloo landfill life (31 hectares) is to 1994.
- expansion of Waterloo landfill will extend life as follows:
 - North expansion (14 hectares) - until 2007 with recycling
 - South expansion (27 hectares) - until 2025 with recycling
- existing Cambridge landfill life is to 2001.
- expansion of Cambridge landfill for inerts is planned which will extend the life by over 40 years with recycling.
- without recycling, these capacities would be reached sooner.

WASTE DIVERSION PROGRAMS

BLUE BOX

- all 7 area municipalities have curbside Blue Box programs.
- apartment buildings are being added.
- currently recycling newspaper, cans, bottles, jars, PET.
- Bell telephone books were added in February.
- corrugated cardboard were added as of the April 1st ban.
- mixed plastics may be added later in 1991.
- investigating the addition of mixed paper, boxboard.
- all materials now handled by the Materials Recycling Centre.

BACKYARD COMPOSTING

- 5,000 modified blue barrels distributed in 1989.
- distributing over 20,000 units this spring/summer.
- charge will be \$20 per unit (all taxes included).
- each resident may purchase one composter & one digester.
- education program on how to compost/digest.
- includes -- reduce waste by leaving grass clippings on lawn.
- conducting project to determine level of participation we can expect from residents that is sustainable.

CENTRAL COMPOSTING

- currently composting mainly leaves -- windrow technique.
- grass and other yard waste may be added in the next year.
- facilities at both landfill sites (Waterloo, Cambridge).
- compost is used by the region and local municipalities.
- compost has been made available to residents free of charge.
- investigating the collection/composting of food waste.

INDUSTRIAL/COMMERCIAL/INSTITUTIONAL

- generates approx 2/3 of the Region's total waste.
- implementing ban of cardboard from landfill as of April 1st.
- conducting waste assessments to help business reduce.
- providing newsletter and other information.
- programs to target major waste streams: food, paper.

PUBLIC EDUCATION & PROMOTION

- waste management curriculum in K1-6 now in place.
- public presentations on ongoing basis.
- Environment Week and Recycling Week activities.
- advertising and promotion to support new programs.
- all promotion to emphasize the 3Rs and their priority.

For information, contact Recycling Office 747-5010, or Dan Balfour, Recycling Manager, 885-9776.

**REGIONAL MUNICIPALITY OF WATERLOO
MATERIALS RECYCLING CENTRE**

CAPITAL

Building	\$3,400,000	38,000 sq ft
Equipment	\$1,700,000	

OPERATING

Costs	\$1,000,000
Revenues	\$ 600,000

MATERIALS

	<u>Current Tonnes/yr</u>	<u>2010 Anticipated</u>
Newspaper	9,000	15,000
Cardboard	6,000	9,000
Glass	2,000	4,000
Cans	1,000	2,000
PET	100	200
Phone Books	200	300
Mixed Plastics	future	
Mixed Papers	future	

OPERATIONS

Contractor	Laidlaw
Supervisor	1
Forklift/Baler Operator	1
Loader Operator	1
Sorters	6 (full shift)

EQUIPMENT

Baler	Ambaco NSB352
Main Conveyor System	Commingled (glass, cans, PET)
Glass Conveyor System	

COMPOSTING - AN ESSENTIAL COMPONENT FOR WASTE MANAGEMENT STRATEGIES

by
Jack Pos, President, Jack Pos &
Associates Ltd., Guelph, Ontario

INTRODUCTION (1)

Composting is not a human invention, but a vital waste management process of nature, which the world inherited with its creation. In a holistic perspective of the earth, composting may be the essential component that will assist in reconnecting western mankind and his habits to the earth and its resources.

The natural process of plant photosynthesis produces, annually, large quantities of food and fibre. This organic material passes through plant and animal life cycles both on land and in water to produce more food and fibre, and in addition, organic waste from humans, animals and crop residues. Advancements in science and technology both in industry and the private sector, while producing a host of new consumer goods, has also produced a variety of complex by-products to add to an already growing waste stream.

COMPOSTING (2)

The break-down of the organic component of waste products can be brought about by either 'anaerobic' decomposition or 'aerobic' decomposition, primarily by micro-organisms already present in the natural environment. These microscopic forms of plants and animals feed upon and digest the organic residues producing by-products and a humic end product. Anaerobic means 'without air' particularly oxygen; and the by-products of the process include: methane, carbon dioxide, organic acids and chemical "intermediates"; the process also has a high potential for foul odours. However, with the introduction of oxygen to create an aerobic environment, the basic process can be accelerated considerably. The by-products of aerobic decomposition include: water vapour, carbon dioxide, energy in the form of heat, a "stabilized" organic matter called 'compost', and a low odour potential.

Millions of dollars were spent recently when a barge, full of municipal garbage, endeavoured to dump its wasted cargo into the sea along the east coast of North America; contrast that to this brief extract from '*Les Miserables* by Victor Hugo circa. 1862' ... "*We fit our convoys of ships, at great expense, to gather up at the south pole the (composted) droppings of petrels and penguins, and the incalculable element of wealth which we have under our own hand, we send to the sea. All the human and animal manure which the world loses, restored to the land instead of being thrown into the water, would suffice to nourish the world.*"

From my youth, I can still recall stories of my father's experiences immediately following World War #1, when he served as a crewman on a Norwegian Ship which transported composted bird droppings from the Island of Guam, off the coast of East Africa, to the Netherlands to nourish the soil reclaimed from the sea and to provide fertilizer for the production of flowers.

The main reason for composting is to recover a resource from organic wastes and return it to the land, thereby completing the earth's organic cycle. In short, we need to return organic compounds to agricultural soils.

The second response to "Why compost", which almost takes on a trivial significance in relation to the earth's dietary-fibre requirements, is that composting is a waste management tool that can divert a sizeable proportion of waste from landfills.

In order to arrive at an overall perspective of the amount and distribution of the total amount of waste handled in the Province of Ontario, it was necessary to extrapolate similar information assembled by G.L. Ferrero and P. L'Hermite (3), and estimating the figures presented in

TABLE 1

ESTIMATED AMOUNT OF WASTE PRODUCED IN ONTARIO

(Assume Population of 11,000,000)

TYPE OF WASTE		ANNUAL PRODUCTION	
		(tonnes)	(%)
DOMESTIC WASTE (D.W.)	-	3,652,387	14.00
INDUSTRIAL WASTE (I.W.)	-	3,392,928	13.00
SEWAGE SLUDGE (S.S.)	-	5,219,122	20.00
EXTRACTIVE INDUSTRIES (E.I.)	-	4,959,662	19.00
DEMOLITION DEBRIS (D.D.)	-	2,604,571	10.00
CONSUMER WASTE (C.W.)	-	2,345,112	9.00
(Cars, tires, appliances, etc.)			
OTHER WASTES (O.W.)	-	3,911,846	15.00
(Litter, leaves, grass, etc.)			
TOTAL	- 268 -	26,085,628	100.00

TABLE 2

COMPOSITION AND AMOUNT OF DOMESTIC WASTE (Estimated for the Province of Ontario)*

DOMESTIC WASTE COMPONENT	WEIGHT (tonnes)	PERCENT OF TOTAL WEIGHT (%)	VOLUME (m ³)	PERCENT OF TOTAL VOLUME (%)	(**)
FOOD	1,045,313	28.62	3,972,073	9.72	(Y)
SANITARY NAPKINS	7,305	0.20	91,872	0.22	(Z)
DIAPERS	94,962	2.60	541,316	1.33	(Z)
PET DROPPINGS	66,108	1.81	138,814	0.34	(Z)
ASHES	10,227	0.28	49,154	0.12	(Y)
VACUUM BAGS	10,592	0.29	65,657	0.16	(Z)
NEWSPAPERS	575,981	15.77	362,887	8.88	(Y)
GLOSSY PAPER	207,456	5.68	663,807	1.63	(Y)
FINE PAPER	74,874	2.05	651,568	1.59	(Y)
BOXBOARD	119,068	3.26	3,155,498	7.74	(X)
MIXED PAPER	142,078	3.89	2,586,321	6.32	(Y)
O.C.C.	106,650	2.92	4,607,568	11.30	(X)
FILM PLASTICS	93,136	2.55	6,360,793	15.54	(X)
PLASTIC CONT.	48,942	1.34	1,540,626	3.77	(X)
FOAM PLASTICS	10,227	0.28	540,997	1.34	(Z)
P.E.T.	5,479	0.15	374,117	0.92	(X)
OTHER PLASTICS	54,055	1.48	1,476,396	3.62	(X)
METAL CANS	138,425	3.79	2,366,624	5.79	(X)
OTHER METALS	37,254	1.02	484,629	1.19	(X)
CLEAR GLASS	179,697	4.92	754,715	1.85	(X)
COLOURED GLASS	104,824	2.87	461,134	1.13	(X)
NONE CONTAINERS	6,940	0.19	29,809	0.07	(X)
CERAMICS	20,453	0.56	88,090	0.22	(Z)
MULTI. MAT.	86,927	2.38	2,972,229	7.26	(Z)
WOOD	54,055	1.48	183,853	0.46	(X)
TEXTILES	87,292	2.39	637,310	1.56	(Z)
INERT MAT.	70,126	1.92	203,333	0.50	(Z)
RUBBER	3,652	0.10	13,034	0.03	(Z)
LEATHER	2,557	0.07	9,084	0.02	(Z)
HAZARDOUS	14,244	0.39	83,954	0.20	(Z)
RESIDUE	173,488	4.75	2,116,881	5.18	(Z)
TOTAL	3,652,387	100.00	37,987,127	100.00	

* Basic data from City of Guelph 'Wet/Dry Pilot Project, 1991, and extrapolated for the Province of Ontario (Assuming a population of 11,000,000).

** Speculated distribution of total 'Domestic Waste Component':

(X) = For recycling, 948,525 tonnes, or 26.0 %
 (Y) = For composting, 2,055,929 tonnes, or 56.2 %
 (Z) = For other disposal, 647,933 tonnes, or 17.8 %

Much of the current research in evaluating waste generation has been directed toward domestic or household waste. Table No. 1, gives some indication of the distribution of all types of waste, and shows that domestic waste represents 14% of the total. However if yard waste is included, the combined percentage increases to nearly 30%. The European countries tend to separate 'litter, leaves, and grass' from domestic waste since a large component of this type of waste comes from municipal parks, playing fields, and recreation areas, and should not be totally included as household yard waste. Agricultural waste is not included since much of the animal manures and crop residues are returned directly to the soil for composting. Even in densely populated countries such as France and the Netherlands, agricultural waste represents over 40% of the total.

The City of Guelph has, in part, completed a one year study from samples collected, sorted and analyzed from randomly selected homes in their pilot studies of 'two stream' and 'three stream' source separated municipal waste. The samples were sorted into 31 categories, weighed and volumes determined while loosely packed under 0.011 pounds per square inch pressure. By using the 'Composition and Amount of Domestic Waste' from the Guelph Data (4), but not including 'yard waste', and using the domestic waste fraction (3,652,387 tonnes) from Table 1, the composition and amount of the various components of total annual domestic waste production for the Province of Ontario is shown in Table 2.

Those components which could be available for 'recycling' (X), 'composting' (Y), or 'other disposal' (Z), are tentatively identified, and show that approximately 56 % of domestic waste can be composted. Since the emphasis in this discussion is on composting, newsprint and other papers are included in the compost fraction. While this is an excellent carbon source when adjustments to the carbon to nitrogen ratio are required, there is some concern for contamination from the various inks that may be used. As composting becomes more wide spread, some pressure may be imposed on the inking industry for a more environmentally friendly product. Of course if it is more cost effective to recycle newsprint and paper, then it should not become part of the compost stream. Nevertheless, it will still be part of the total that is diverted from landfill.

If the domestic fraction of 'yard waste' were included in the above scenario, the total compostable amount could be increased significantly. Data from the City of Guelph Wet/Dry Pilot Project shows that the annual weight of domestic produced yard waste is slightly above that of the food waste component. Adding the domestic yard waste component to Table 2, the

speculated distribution of total 'Domestic Waste Fraction' is summarized as follows:

For recycling,	948,525 tonnes or 20.2 %
For composting,	3,101,242 tonnes or 65.8 %
For other disposal,	647,933 tonnes or 14.0 %

While 65.8 % of the total domestic waste fraction may be available for composting, the actual amount recovered from the various components as received will depend on the amount of soiled material and cross contamination, as well as the efficiency and thoroughness of sorting, whether source sorted or site sorted, and whether a two stream or three stream collection system is used.

TABLE 3
SEPARATED FRACTIONS OF EACH TYPE OF WASTE
(Estimated)

TYPE OF WASTE	FOR RECYCLING		FOR COMPOSTING		OTHER DISPOSAL	
	(TONNES)	(%)	(TONNES)	(%)	(TONNES)	(%)
	948,525	26.00	2,055,929	56.00	649,933	18.00
D.W.	1,866,110	55.00	339,293	10.00	1,187,525	35.00
I.W.	0.0	-	5,219,122	100.00	0.0	-
S.S.	495,966	10.00	198,386	4.00	4,265,309	86.00
E.I.	130,229	5.00	52,091	2.00	2,422,251	93.00
D.D.	1,407,067	60.00	0.0	-	938,045	40.00
C.W.	<u>78,237</u>	<u>2.00</u>	<u>3,129,801</u>	<u>80.00</u>	<u>704,132</u>	<u>18.00</u>
O.W.	4,890,706	18.75	11,129,801	42.67	10,065,120	38.58
TOTALS						

Table No. 3, gives some indication of the total amount of waste from each type that can be diverted from landfill. Over 60% of all wastes produced in the Province of Ontario can be recycled as a resource and composted. This will not happen without a great deal of support and leadership from various levels of Government, the scientific community and the general public.

RECYCLING

The Ontario 'Blue Box' recycling program is being used successfully by a number of municipalities to collect paper, glass, metal, rigid plastics and in several cases film plastic. However, there is some concern for contamination when several different types of recyclables are collected in a single container. If the program is to continue and become more effective, a new type of multi-purpose container should be designed (perhaps with adjustable compartments or dividers) to reduce contamination and insure a quality product. As the recycling program becomes more widely accepted, and new technologies are developed to utilize the recovered resources, other types of waste, such as leather and textiles, may be included. Funding, promotion and education must continue to insure that all municipalities in the Province are participating in this priority effort to increase the amount of resource material recovered from the waste stream and thereby reduce the amount for landfill. However, 'reduce' and 'recycle' (blue box) together will not achieve the goal of the Ontario Ministry of the Environment, to divert 50 % of the waste stream by the year 2000, based on quantities of waste generated in 1988.

COMPOSTING - THE ESSENTIAL COMPONENT

It has been said that composting is not a proven technology, therefore resistance prevails; perhaps some of us are at fault in not promoting the very favourable results of research that was undertaken at the University of Guelph and partly funded by the Ministry of the Environment in 1969. As a result of this research a modest size (60 tons/day) plant was built for Roslyn Park Farms, New Dundee, over 17 years ago. This plant is still in operation, and apart from routine maintenance and service, has not required even minor repairs.

The feedstock, predominately agricultural waste, is fed into the continuous, 'open channel' process and following a ten day retention time, the finished product, a rich black humus, is packaged and retailed through garden centres. A similar 'open channel high-rate aerobic system has been in operation at the University of Guelph for the past seven years. Other commercial composting plants, commissioned in the past five years, are located in Olds, Alberta; Yellowknife, North West Territories; St. Paul, Minnesota; and Hubberton Massachusetts.

Backyard composters, on the other hand, are still in the development stage. Of the dozen or more that have appeared on the market in the past

three years, none of them employ the high-rate aerobic process. Since most of them are merely holding bins, it is quite difficult to properly mix and aerate the contents. Furthermore, capture rates for those participating in the program will be less than 100%, since meats, fatty foods and dairy products are not to be included in the backyard holding bins. Therefore, those waste materials must continue to be sent to landfill and contribute to the problems of odours and rodent infestations.

Nevertheless composting, both backyard and commercial/centralized, must be integrated with recycling to meet MOE's objective for 50 % diversion by the year 2000. Some segments of society would prefer an integrated program with the objective for a total diversion of all compostible materials from landfill.

BACKYARD COMPOSTING:

Backyard composters have the potential to divert large quantities of organic wastes from the municipal/residential waste stream at relatively low cost. It has only recently been recognized as an effective waste management tool which would benefit from greater government support.

The primary objectives for promoting backyard composting are listed as follows:

1. to reduce the amount of waste placed at curbside and consequently the amount for collection and transport for disposal at the landfill;
2. to reduce the amount of putrescibles and consequently reduce odour and vermin problems as well as production of leachate and methane at the landfill;
3. to increase environmental awareness and to involve residents in municipal waste management programs;
4. to improve the quality by removing contaminants from recyclables.

By the end of this year over 200,000 composters will have been installed in residential backyards in Ontario, and this number is expected to increase at the rate of 80,000 units per year with the hope that over 1,800,000 households will be using backyard composters by the year 2000. The MOE is currently subsidizing municipalities 50% of the cost (avg. assumed unit cost = \$50). The choice of type of composter/s is made by the municipality. The

types presently available are essentially limited to anaerobic bins, and in many cases the final selection is based on discount incentives by the manufacturers.

The MOE should encourage the development of truly aerobic backyard composters. While it may be correct to claim that the end product, whether by aerobic or anaerobic digestion is still compost, most home-owners would prefer to see the results in the same season than have to wait for the following year and put up with unpleasant odours from anaerobic decomposition. Home-owners should be allowed to select their own composter and be prepared to pay the difference between the selling price and the standard subsidy. The subsidy (50%) from the Ministry of the Environment may be further augmented by the municipality.

CENTRALIZED COMPOSTING:

All households do not live in single family residences with backyard space for composting, nor is all compostible materials produced in households. Therefore, additional composting capacity will be required for people in multiple family facilities, and for organic matter produced in the Institutional, Commercial and Industrial (ICI) sectors.

It is possible that small commercial composters may be designed for institutions, fast food chains, hospitals, large apartment buildings, etc., particularly where the compost may be used on the grounds such as colleges and commercial buildings. But these would only divert a small percentage of the total organic waste stream.

There are three basic composting systems namely: 1) Static Pile, 2) Windrow, and 3) In-Vessel. There are many others, but they are simply hybrids. The static pile and windrow systems are low tech, inexpensive, labour intensive, require a large area, usually unprotected from the elements, and are not odour free. In-vessel systems are high tech, expensive, low labour requirement, least space requirements, usually enclosed in a building, and relatively odour free. The hybrids endeavour to maximize the advantages and minimize the disadvantages of all three systems. They are designed to accommodate the unique characteristics of specific feedstock and bulking agents, and operated to suit the circumstances and environmental requirements of the site.

At the present time there are no centralized composting facilities in Ontario designed specifically for organic materials from municipal solid waste; although several are currently in the design stage. Since the MOE will not achieve its goal of 50% diversion from landfill without some form of

centralized composting, support in the form of funding, regulations, guidelines, education and promotion is urgently needed.

Initially, funding support should be given to current applications to insure that several different types and sizes of centralized composting systems are in operation as soon as possible for study and demonstration. When public funds are used to construct such facilities, either for municipalities or the private sector, the research data and operational information obtained should be available to the public.

The escalating high costs, financial and social, in finding new landfill sites makes it even more apparent that more environmentally friendly alternatives are needed to restore government's integrity to its citizens. Full scale centralized composting demonstration programs will provide research facilities that will not only allow for technological information transfer, but lead to the development of systems designed specifically for the needs of Ontario.

The approvals process must be re-designed to encourage composting alternatives. Composting is entirely different from landfilling; high-rate aerobic composting is a resource recovery process, void of the characteristic landfill odours and leachate problems and does not bury the raw materials to become problems for future generations. In fact it takes out of the waste stream the organic materials that are the source of most of the problems with landfills and converts them into a useful soil amendment. With the annual loss of so much prime agricultural land, it is welcome news that a means may soon be available to recover marginal lands. Therefore, regulations and approvals procedures for composting sites and operation should not be the same as for landfills.

To provide greater encouragement and incentives for composting as a viable alternative, in part, to landfilling, aid should be provided in the form of: tax breaks on capital equipment for composting and reduced taxes on the sale of the finished product; differential tipping fees for mixed waste vs sorted non-compostable wastes; and virgin tax on competing products.

The imposition of bans, such as yard waste, will hasten the implementation of composting both backyard and centralized; but alternatives must be in place before they are imposed. The Ministry should set successive targets to be phased-in over a period of time banning specific organics from landfill; and set Provincial goals for composting.

MOE, in cooperation with the Ministry of Education and School Boards, should encourage further, the development of appropriate waste management

curriculum, to stimulate an awareness of long range goals. Ask yourselves the question, "would the adults of the 1970's have been as receptive to the blue box program as the adults of the 1990's"? Not likely. I believe the difference is the children of the 1980's, who accepted the challenge to get involved with class activities such as picture messages about the environment, organizing pop can recovery and other waste sorting exercises.

The future belongs to our young people, the legacies we leave them today will be an inspiration to them to leave a healthy environment for their children.

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38TH ONTARIO WASTE MANAGEMENT CONFERENCE

JUNE 16-19, 1991

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